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ABSTRACT

This study was a formative evaluation of an evolving preservice teacher education program in secondary mathematics education at The Ohio State University. The first quarter of the program was an intensive block of pre-student teaching experiences, including four weeks at an inner city school and four weeks at a suburban school along with campus seminars emphasizing educational philosophy, sociology, and mathematics methods. The second quarter consisted of student teaching in one school. This program (project) operated concurrently with the traditional program (non-project). The project teachers were pre- and posttested during their pre-student teaching (n=52) and posttested during their student teaching experience (n=48). The non-project teachers (n=23) were pre- and posttested during their student teaching. The tests used were Skeel's CULTURAL ATTITUDE INVENTORY, the TEACHING SITUATION REACTION TEST, and two investigator-constructed instruments. Results showed no significant differences between project and non-project student teachers on the criterion measures. Significant losses on each of the criterion variables were exhibited, with cultural attitudes and reactions to teaching situations showing the greatest negative change. A substantially higher percentage of project than non-project student teachers indicated an increased commitment to teaching and a posttest preference for junior high school teaching. (Author/DT)

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# AN EVALUATION OF A SECONDARY MATHEMATICS TEACHER EDUCATION PROGRAM EMPHASIZING SCHOOL EXPERIENCES IN CONTRASTING CULTURAL SETTINGS

John Jay Graening, Ph.D.

1971

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# AN EVALUATION OF A SECONDARY MATHEMATICS TEACHER EDUCATION PROGRAM EMPHASIZING SCHOOL EXPERIENCES IN CONTRASTING CULTURAL SETTINGS

By

John Jay Graening, Ph.D.

The Ohio State University, 1971

Professor F. Joe Crosswhite, Advisor

This study was a formative evaluation of an evolving pre-service teacher education program in secondary mathematics education at The Ohio State University.

The program was a cooperative effort with the Columbus schools. It was designed to integrate the theoretical and practical components in pre-service teacher education by combining varied campus and community activities with increasing and diverse school responsibilities.

The first quarter of the program was an intensive block of pre-student teaching experiences. The pre-service teachers spent four weeks in an inner city school and four weeks in a suburban school. Accompanying the school experiences were related campus seminars emphasizing educational philosophy, sociology, and methods of teaching mathematics. The program culminated in a quarter of student teaching in one school.

This program (project) operated concurrently with the traditional program (non-project). The project teachers were pre- and posttested during their pre-student teaching block (n=52) and posttested during their student teaching experience (n=48). The non-project teachers (n=23) were pre- and posttested during the student teaching quarter.

Hypotheses concerning patterns of change and correlational relationships were tested for both project and non-project teachers. These focused on the following criterion variables: (1) perceptions of what should occur in secondary mathematics teaching as measured by the Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP), (2) compatibility to teach in culturally disadvantaged schools and attitudes toward and knowledge of culturally disadvantaged students as measured by Skeel's Cultural Attitude Inventory, and (3) reactions to classroom teaching situations as measured by the Teaching Situation Reaction Test. The strategies and activities used by the cooperating and student teachers in their secondary mathematics teaching were measured by the Mathematics Teaching Inventory: Student Perceptions (MTI:SP). The MTI:TP and the MTI:SP were parallel instruments developed for the study. Additional data from questionnaires and daily logs were informally analyzed.

Project teachers held significantly more positive views of what should occur in the mathematics classroom at the end of the pre-student teaching block than at the beginning. The changes in reactions to teaching situations and cultural compatibility were also more positive but not significant. Questionnaire responses and log

reactions indicated that project teachers were enthusiastic about the program, particularly their in-school experiences.

No significant differences were found between project and non-project student teachers on the criterion measures. A substantially higher percentage of project than non-project student teachers indicated an increased commitment to teaching and a posttest preference for junior high school teaching.

There was a significant positive correlation between the activities and strategies used by the student teachers during student teaching and those of their cooperating teachers. The student and cooperating teachers' perceptions of what should occur in secondary mathematics teaching also correlated significantly in the positive direction.

The most dramatic result of the study was that during the student teaching quarter the pre-service teachers exhibited significant losses on each of the criterion variables. Cultural attitudes and reactions to teaching situations had the greatest negative change.

# AN EVALUATION OF A SECONDARY MATHEMATICS TEACHER EDUCATION PROGRAM EMPHASIZING SCHOOL EXPERIENCES IN CONTRASTING CULTURAL SETTINGS

DISSERTATION

Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in the Graduate School
of the Ohio State University

by

John Jay Craening, B.A., M.A.

* * * * *

The Ohio State University
1971

Approved by

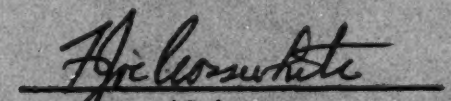

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TABLE OF CONTENTS


| | Page |
|---|---|
| ACKNOWLEDGEMENTS | ii |
| VITA | iii |
| LIST OF TABLES | vii |
| Chapter | |
| I INTRODUCTION | 1 |
| Background and Significance of the Study | 2 |
| Description of the Teacher Education Program | 5 |
| Definition of Terms | 7 |
| Objective of the Study | 9 |
| Hypotheses | 10 |
| Limitations of the Study | 13 |
| Overview | 14 |
| II REVIEW OF RELATED LITERATURE | 15 |
| Teaching Effectiveness and Teacher Behavior | 15 |
| Reliability of Pupil Evaluation | 23 |
| Influence of the Cooperating Teacher on the Student Teacher | 28 |
| Criticisms of Student Teaching | 32 |
| Experimental Teacher Education Programs | 34 |
| III RESEARCH DESIGN AND METHODOLOGY | 45 |
| Population and Samples | 45 |
| Instruments Used in the Study | 52 |
| Procedures for Administration of Instruments | 62 |
| Statistical Programs Used for Analyses | 67 |
| IV ANALYSIS OF DATA | 68 |
| Patterns of Change | 68 |
| Correlations | 79 |

TABLE OF CONTENTS - Continued


| Chapter | | page |
|---|---|---|
| V | INFORMAL ANALYSIS OF ADDITIONAL DATA . . . . . | 105 |
| | A Comparison of the MTI:TP and the MTI:SP Responses . . . . . | 105 |
| | Responses From $S_1$ Questionnaires . . . . . | 109 |
| | Comments From Daily Logs . . . . . | 118 |
| | Responses From Student Teaching Questionnaires . | 121 |
| | Comparison of Project and Non-project Teachers . | 130 |
| VI | SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS . . . . . | 137 |
| | Summary . . . . . | 137 |
| | Conclusions . . . . . | 139 |
| | Discussion . . . . . | 143 |
| | Recommendations for Program Revision . . . . . | 146 |
| | Recommendations for Further Research . . . . . | 147 |
| APPENDICES . . . . . | | 151 |
| A | Mathematics Teaching Inventory: Teacher Perceptions . . . . . | 152 |
| B | Mathematics Teaching Inventory: Student Perceptions . . . . . | 161 |
| C | Cultural Attitude Inventory . . . . . | 168 |
| D | Teaching Situation Reaction Test . . . . . | 172 |
| E | Contemporary Mathematics: A Test for Teachers . . | 189 |
| F | Checklist for Assessment of Teachers: Supervisor's Perceptions . . . . . | 200 |
| G | Checklist for Assessment of Teachers: Pupil's Perceptions . . . . . | 206 |
| H | Pre-Student Teaching Block Questionnaires . . . . | 209 |
| I | Student Teaching Questionnaires . . . . . | 215 |
| J | Percentage of Students in Agreement with the Key for Each Item of the MTI:SP . . . . . | 222 |
| K | Percentage of Agreement with the Key on Parallel Items of the MTI:SP and the MTI:TP . . . . . | 225 |
| L | Correlation Matrix of the Criterion Variables with the Pre-Student Teaching Block Variables . | 228 |
| M | Fold-Out Listing of Project Pre-Service Teacher Variables Used in Correlational Analyses for the Pre-Student Teaching Block . . . . . | 232 |
| N | Correlation Matrix of the Criterion Variables and Other Selected Variables with [illegible] Student Teaching Variables . . . . . | 233 |

TABLE OF CONTENTS - Continued

APPENDICES — Page

O Fold-Out Listing of Student Teacher and Cooperating Teacher Variables Used in Correlational Analyses for the Student Teaching Quarter . . . . . 245

BIBLIOGRAPHY . . . . . 246

## LIST OF TABLES


| Table | | Page |
|---|---|---|
| 1. | Distribution of Pre-service Teachers by Program Categories and Quarter . . . . . | 46 |
| 2. | Selected Characteristics of Project Pre-service Teachers During the Pre-student Teaching Block . . . . | 47 |
| 3. | Selected Characteristics of Pre-service Teachers During the Student Teaching Quarter . . . . . | 48 |
| 4. | Selected Characteristics of Cooperating Teachers During the Student Teaching Quarter . . . . . | 50 |
| 5. | Distribution of Schools and Classes by Program and Kind-of-School Classifications for the Student Teaching Quarter . . . . . | 51 |
| 6. | Distribution of Classes by Subject Area, Program, and Kind-of-School Classifications for the Student Teaching Quarter . . . . . | 52 |
| 7. | Kuder-Richardson 20 Reliability Estimates for the Mathematics Teaching Inventory: Teacher Perceptions . | 55 |
| 8. | Kuder-Richardson 20 and 21 Reliability Estimates for the Mathematics Teaching Inventory: Student Perceptions . . . . . | 58 |
| 9. | Sequence of Instrument Administration . . . . . | 64 |
| 10. | Correlated t-values for Comparison of $S_1$ Project Teachers' Pretest and Posttest Scores . . . . . | 70 |
| 11. | Means and Standard Deviations on the MTI, CAI, and TSRT for the Autumn, Winter, and Total $S_1$ Project Groups . . . . . | 73 |
| 12. | Correlated t-values for Comparison of Student Teachers' Pretest and Posttest Scores . . . . . | 75 |
| 13. | Correlated t-values for the Comparison of Project Teachers' $S_1$ Pretest and $S_2$ Posttest Scores . . . . | 79 |

Table


| | | Page |
|---|---|---|
| 14. | Pre-student Teaching Quarter Variables Correlating Significantly with the Composite MTI:TP Pretest Scores | 81 |
| 15. | Pre-student Teaching Quarter Variables Correlating Significantly with the Composite MTI:TP Posttest Scores | 82 |
| 16. | Pre-student Teaching Quarter Variables Correlating Significantly with the Composite Cultural Attitude Inventory Pretest Score | 83 |
| 17. | Pre-student Teacher Quarter Variables Correlating Significantly with the Composite CAI Posttest Score | 83 |
| 18. | Pre-student Teacher Quarter Variables Correlating Significantly with the Pretest CAI Attitude Subscale Score | 85 |
| 19. | Pre-student Teaching Quarter Variables Correlating Significantly with the Posttest CAI Attitude Subscale | 86 |
| 20. | Pre-student Teaching Quarter Variables Correlating Significantly with the Pretest CAI Knowledge Subscale | 87 |
| 21. | Pre-student Teaching Quarter Variables Correlating Significantly with the Posttest CAI Knowledge Subscale | 87 |
| 22. | Pre-student Teaching Quarter Variables Correlating Significantly with the TSRT Pretest | 88 |
| 23. | Pre-student Teaching Quarter Variables Correlating Significantly with the TSRT Posttest | 89 |
| 24. | Pre-student Teaching Quarter Variables Correlating Significantly with Junior Project Participation | 90 |
| 25. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Composite MTI:SP Scores | 92 |
| 26. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Composite MTI:TP Pretest Scores | 94 |

Table


| | | Page |
|---|---|---|
| 27. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Composite MTI:TP Posttest Scores | 95 |
| 28. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Composite CAI Pretest Scores | 96 |
| 29. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Composite CAI Posttest Scores | 97 |
| 30. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Pretest CAI Attitude Subscale Scores | 98 |
| 31. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Posttest CAI Attitude Subscale Scores | 99 |
| 32. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Pretest CAI Knowledge Subscale Scores | 100 |
| 33. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Posttest CAI Knowledge Subscale Scores | 101 |
| 34. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Pretest TSRT Scores | 102 |
| 35. | Student Teaching Quarter Variables Correlating Significantly with the Student Teachers' Posttest TSRT Scores | 103 |
| 36. | Grade Level Preferences of Project and Non-project Teachers | 131 |
| 37. | Kind-of-School Preferences of Project and Non-project Teachers | 132 |
| 38. | Type-of-Student Preferences of Project and Non-project Teachers | 133 |
| 39. | Responses Concerning Commitment to Teaching for Project and Non-project Teachers | 134 |

Table

Page

40. Means and Standard Deviations for Project and Non-project Student Teachers on the MTI, CAI, TSRT and CFAT . . . . . 135

# CHAPTER I

## INTRODUCTION

This study is a formative evaluation of an evolving teacher education program in secondary mathematics education at The Ohio State University. If a program is to be sensitive to the needs of students, it must be continually subjected to formative evaluation for self-renewal and improvement. Osborne has indicated that "the largest single problem we have in the design and operation of this program is the assessment of the program." (38, 7) This study, by providing base-line data, could also be an important first step in a long-term, summative evaluation of the program.

The College of Education at The Ohio State University has endorsed a recommendation "...that an assessment system be developed to ensure quality and to stimulate improvement in the programs of the College and of the individual faculties and other subunits." (2, 6) The Assessment Council of the College has suggested three major reasons for the systematic evaluation of education.

> The quality of educational programs depends upon the quality of decisions concerning those programs which in turn require sound information. Second, society is demanding that educators be accountable. Third, parents, students and others are not fully supporting an educational system they do not

understand. A systematic assessment and evaluation process can aid decision making, accountability and understanding." (3, 1)

## Background and Significance of the Study

There has been an unusual public and professional interest in improving school mathematics in recent years. The public support for the improvement of mathematics and science in our schools, the availability of federal funds, and the creation of numerous curriculum committees, conferences, and projects have led to unusually swift content reforms.

With all the concern for curricular changes in mathematics, comparatively little attention has been given to the problem of preparing teachers for these modern programs. Goodlad has stated that the modern programs require a fundamentally different kind of role for the teacher.

> The dominant position in current modern curriculum reform is that the teacher is of prime importance .... In projects making extensive use of programing, however, there has been relatively little commitment to changing the teacher's role beyond gaining his willingness to introduce the materials into the classroom.... Many teachers simply cannot adapt themselves to what is required. Long conditioned to deductive approaches, they turn materials intended for student investigation into objects of rote response.... Teachers are being asked to preside over a fundamentally different kind of learning-teaching process. To think that they will make the transformation easily is naive.... Clearly, curriculum planners must not stop with the production of materials. (26, 102-103)

The current state of secondary pre-service teacher education indicates it has not kept pace with the curriculum content reforms. Suggestions for change in the content preparation of prospective secondary mathematics teachers have come from the Committee of the Undergraduate Program in Mathematics (CUPM) of the Mathematical Association of America. Although there has been some movement in the direction suggested by CUPM, critics such as Rising feel that very little progress has been made toward adequately preparing pre-service teachers.

> Education programs for mathematics teachers are not only below any reasonable acceptable standard, they are getting steadily worse!... While mathematicians and classroom teachers are working together to provide strong mathematics texts for students at all levels, the teachers who will be expected to implement those texts are nurtured on programs that are at best oblique to the tasks they face in the classroom.... Students today have mathematics backgrounds that are much stronger than was the case for the average undergraduate a decade ago. Yet today's students are being given little professional assistance to develop techniques for translating their mathematical knowledge into viable classroom procedures. (42, 296-297)

Complaints that education and methods courses are too theoretical and irrelevant are frequently heard. "While the current curriculum reform is closing a long-standing gap between curricular theory and school practice, it has not been able so far to influence the content and pedagogy in those colleges and universities that prepare tomorrow's teachers, educational leaders, and teachers of teachers." (26, 111) "Greater attention to the blend of theory and practice in preparing teachers seems to be essential if we are to achieve efficiency beyond that characteristic of many programs." (12, 255)

The concerns and needs of today's prospective teachers, however, extend beyond the problem of relevancy. Galloway has suggested that current pre-service teachers are distinctly different from those of the past generation.

> While teacher candidates have long questioned the relevance of certain prescribed courses, their present objections are based on their need to deal more effectively with cultural realities. They know something of the problems in the inner-city. They worry about the racial question. They want to know what to teach and how to teach it. They doubt the propriety of traditional methods courses. They want to know how this or that activity helps them to become a better teacher. It has been suggested that teacher candidates of today are more demanding, more pragmatic, and more mature.... They are far less naive than teacher candidates of an earlier generation. They are a different breed with a new mission. (22, 213)

Galloway has also indicated that the public schools are assuming a greater responsibility for teacher education.

> Public school systems have changed their outlook too. The day of unquestioning reliance on teacher colleges to prepare all teachers for every situation has passed. For one thing, teacher education institutions have failed to prepare teachers for the inner-city and urban setting. School systems want the four years of pre-service preparation to be related to the realities of their teaching situations; they want teacher candidates to have actual experiences and to be prepared more adequately. School systems have erred in believing that teacher education was the sole business of the teacher colleges, and schools of education have done little to discount the myth. The belief was perpetuated that programs were keeping pace with the changing times, but that projection has been severely questioned by school systems. Teacher education is a long-time affair, and it requires co-operative working agreements between schools of education and school systems. (22, 213-214)

## Description of the Teacher Education Program

The Faculty of Science and Mathematics Education at The Ohio State University is developing a teacher education program for prospective secondary teachers which attempts to deal with many of the current criticisms and needs of teacher education. The program utilizes extensive school experiences, emphasizes early in-school envolvement, provides direct experience in two contrasting cultural settings (usually inner city and outer city), and is a cooperative effort with the Columbus schools. It has become a training ground for teacher educators through its extensive use of graduate assistants.

The program content and organization is designed to integrate the theoretical and practical components of pre-service teacher education. The four-quarter sequence of experiences during the junior and senior years combines varied campus and community activities with increasing and diverse school responsibilities.

The junior experience has an emphasis on the cognitive characteristics of the individual at various stages of development and the psychology of learning mathematics. Each junior tutors a single junior high school student during the first quarter of this experience, and teaches small groups of elementary students and assists the elementary classroom teacher during the following quarter. These experiences are accompanied by after-school seminars and occur twice a week throughout each of the two quarters.

The senior portion of the program, which is the focus of the present study, shifts its concern from a consideration of the psychology

of the individual to a study of techniques for teaching groups of mathematics students coupled with educational philosophy and sociology. The first quarter of the senior program, $S_1$, is a demanding, full-time block of pre-student teaching experiences. An introductory series of seminars and field trips provide the student with an overall perspective of socio-economic contrasts in several community settings and acquaint him with program and supervisory personnel of the Columbus Public Schools. The seniors are then paired into teams and assigned as such to a school and a coordinating secondary mathematics teacher for four weeks. This is followed by a similar four-week assignment in another school having a different environmental setting. The contrast usually involves inner city and suburban schools. It may also include a junior high-senior high comparison. The half-day, morning sessions in these schools of contrasting socio-economic environments are mutually complemented by on-campus seminars and individually directed study. The seminars utilize talents found in several University departments and community agencies. They emphasize methods of teaching mathematics, educational philosophy, and educational sociology. These $S_1$ experiences are designed to help the prospective teacher consider teaching as a problem-solving, decision-making process in which he takes advantage of his knowledge of the concepts and applications of mathematics while operating in a humanistic fashion.

The culmination of these learning experiences is student teaching, the second segment of the senior program. The $S_2$ quarter is like the typical student teaching quarter except for the addition of a mini research project. The student teacher is expected to define

a problem significant to his particular school situation, to hypothesize a solution to this problem, and to test this hypothesis within the limits of his work in the schools.

The assistance and support of the Columbus school personnel are an integral part of each phase of the program. Their wisdom and professional judgement are essential in providing sequenced teaching activities appropriate to individual needs.

This teacher education program has been developed over the past three years. Although further modications are to be expected, it will become the regular program for preparing secondary mathematics teachers by Autumn, 1971, and the "traditional" program will be phased out. The 1970-71 school year afforded the last opportunity for collecting first-hand, comparative data on the two teacher education programs.

## Definition of Terms

Although most of the terms in this study have their usual connotation, several terms were defined operationally for the purposes of this investigation:

Project - the senior portion of the 1970-71 secondary teacher education program developed by the Faculty of Science and Mathematics Education at The Ohio State University and emphasizing participatory experiences in two contrasting public school settings.

Non-project - the program which has been used for the professional education of secondary mathematics teachers at The Ohio State University and which will be phased out as a regular program by Fall, 1971.

Pre-service teacher - a secondary mathematics education student at The Ohio State University who is enrolled in the project or non-project program.

Pre-student teaching block - the first quarter of the project (denoted by $S_1$).

Student teaching quarter - the quarter in which the pre-service teacher is assigned to a school or schools and has the major responsibility for teaching two or three mathematics classes. (This quarter is denoted by $S_2$ in connection with the project pre-service teachers.)

Cooperating teacher - the secondary school teacher who works with the pre-service teacher during the student teaching quarter.

Culturally deprived student - an individual who lacks many of the opportunities and advantages normally available to American children. (53) (Although this researcher would prefer the terminology of "economically disadvantaged" and "culturally different", Skeel's terminology and definition were adopted for consistency with her Cultural Attitude Inventory that was used in this study.)

Culturally deprived school - a school whose student body contains many culturally deprived students.

Utilitarian orientation - a view of mathematics that favors its practical or useful aspects and emphasizes skills, computation, and applications.

Disciplinarian orientation - a view of mathematics that regards it as a branch of knowledge and has an emphasis on structural concepts, abstract ideas, and thought processes.

## Objective of the Study

The objective of this study was to assess the senior portion of the 1970-71 teacher education program for prospective secondary mathematics teachers at The Ohio State University. Specifically, this study was directed toward two major goals:

To investigate the patterns of change of both the project and the non-project pre-service teachers in terms of:

(1) perceptions about what should occur in secondary mathematics teaching,

(2) strategies and activities used in secondary mathematics teaching,

(3) compatibility to teach in culturally deprived schools,

(4) attitudes toward culturally deprived students,

(5) knowledge of culturally deprived students, and

(6) reactions to classroom teaching situations.

To explore, using correlational techniques, the relationships

of the above six criterion variables with selected measures of teacher characteristics and background.

A complete listing of all the variables used in this study is given in Appendix M, p. 232, for the $S_1$ quarter and Appendix O, p. 245, for the student teaching quarter.

## Hypotheses

The hypotheses which provided a focus for this research were categorized into two subsets - those concerned with patterns of change and those dealing with correlational relationships. These were sub-classified into two types: the first set dealt with the pre-student teaching block, and the second group related to the student teaching quarter. All hypotheses were tested at the .05 level of statistical significance. A detailed description of the instruments used to measure the variables presented in the hypotheses is contained in Chapter III.

### Patterns of Change

At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed their:

($H_1$) perceptions of what should occur in the teaching of secondary school mathematics as measured by the Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP) composite score.

($H_2$) compatibility to work in culturally deprived schools as measured by the Cultural Attitude Inventory (CAI) composite score.

($H_3$) attitude toward culturally deprived students as measured by the CAI attitude subscale.

($H_4$) knowledge of culturally deprived students as measured by the CAI knowledge subscale.

($H_5$) reactions to teaching situations as measured by the Teaching Situation Reaction Test (TSRT).

At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their:

($H_6$) perceptions of what should occur in the teaching of secondary mathematics as measured by the MTI:TP composite score.

($H_7$) compatibility to work in culturally deprived schools as measured by the CAI composite score.

($H_8$) attitude toward culturally deprived students as measured by the CAI attitude subscale.

($H_9$) knowledge of culturally deprived students as measured by the CAI knowledge subscale.

($H_{10}$) reactions to teaching situations as measured by the TSRT.

At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their:

($H_{11}$) perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP composite score.

($H_{12}$) compatibility to work in culturally deprived schools as measured by the CAI composite score.

($H_{13}$) attitude toward culturally deprived students as measured by the CAI attitude subscale.

($H_{14}$) knowledge of culturally deprived students as measured by the CAI knowledge subscale.

($H_{15}$) reactions to teaching situations as measured by the TSRT.

Correlations

There are no significant correlations between the measures of the project pre-service teacher variables and the project teachers':

($H_1$) perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP composite score.

($H_2$) compatibility to work in culturally deprived schools as measured by the CAI composite score.

($H_3$) attitude toward culturally deprived students as measured by the CAI attitude subscale.

($H_4$) knowledge of culturally deprived students as measured by the CAI knowledge subscale.

($H_5$) reactions to teaching situations as measured by the TSRT.

($H_6$) participation in the junior program.

There are no significant correlations between the measures of the student teaching variables and the student teachers':

($H_7$) strategies and activities used in the classroom during student teaching as measured by the Mathematics Teaching Inventory: Student Perceptions (MTI:SP).

($H_8$) perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP.

($H_9$) compatibility to work in culturally deprived schools as measured by the CAI composite score.

($H_{10}$) attitude toward culturally deprived students as measured by the CAI attitude subscale.

($H_{11}$) knowledge of culturally deprived students as measured by the CAI knowledge subscale.

($H_{12}$) reactions to teaching situations as measured by the TSRT.

($H_{13}$) participation in the project.

## Limitations of the Study

Boundary conditions for interpreting the study are:

1. The validity and reliability of the Mathematics Teaching Inventory, the Cultural Attitude Inventory, the Teaching Situation Reaction Test, the Contemporary Mathematics: A Test for Teachers, and the Checklist For the Assessment of Teachers as measuring instruments for the variables of this study.

2. Instruments were not administered at exactly the same point in time during each quarter of this study.
3. The pre-service teachers were not randomly assigned to the two teacher education programs.
4. Student teachers were not randomly assigned to schools and cooperating teachers.
5. The non-project population was comparatively small.
6. The project pre-service teachers were aware that they were part of an innovative teacher education program.
7. The Faculty of Science and Mathematics Education emphasized the project program, since this will become the regular program by Autumn of 1971.

## Overview

This chapter has introduced the study and presented the objectives of the study. Chapter II discusses related research studies and other pertinent literature. A description of the instrumentation and procedures for the study is given in Chapter III. Chapter IV analyzes the data pertaining to the hypotheses. Additional informal information is treated in Chapter V. The last chapter presents summary commentary and recommendations for both program modification and further research.

## CHAPTER II

## REVIEW OF RELATED LITERATURE

This chapter presents a review of research studies and other pertinent literature that have a relationship to the study. The first part is a review of the research on teacher characteristics and behaviors and considers the need of such studies. Next, studies which indicate that students can make reliable judgements about the activities of their teachers or student teachers are presented. The third section reviews the influence of the cooperating teacher. This is followed by recent research illustrating less positive attitudes of student teachers at the completion of their student teaching experience. The last section discusses the design and evaluation of selected teacher education programs.

### Teaching Effectiveness and Teacher Behaviors

Teaching effectiveness has been one of the most studied and researched topics in education during this century. But conclusive results of the quest for the elusive "good teacher" or "effective teacher" have been quite minimal. Popham has stated that

> anyone who has followed the search for a satisfactory measure of teaching proficiency must conclude that this area of inquiry may well represent one of the most high-investment/low-yield activities of our field. For over seventy years researcher after researcher has tried out such devices as administrator ratings, pupil ratings, systematic observations, and student performance on standardized tests. With few exceptions, the results have been thoroughly disappointing. (41, 599)

A major obstacle in obtaining definitive results has been the varying conception of what constitutes good teaching. The goals or criteria for judging teaching have also differed. Widely divergent instructional strategies can be used to promote identical instructional goals. Instruments measuring student achievement have also contributed to this lack of progress due to their insensitivity to various grade levels, subjects, and course emphases. Some evidence suggests that neither teacher education nor teaching experience affects student achievement, which is considered by many to be the ultimate criterion of teaching effectiveness. A study by Moody and Bausell (36), for instance, found no differences in achievement between elementary school students taught a unit in modular arithmetic by experienced, trained teachers and students taught by inexperienced elementary education undergraduates.

Another investigation compared experienced teachers and inexperienced, non-credentialed people who taught units in social science, electronics, and auto mechanics. Each member of the two groups taught one section of a class for the purpose of attaining specific objectives. "Contrary to prediction, the experienced teachers did not markedly outperform their inexperienced counter parts on any of the three teaching performance tests." (41, 601)

A recent study gives further evidence of the inadequacy of present methods of measuring teacher effectiveness. Geeslin (23) investigated the correlations between various measures of teacher effectiveness and the stability of these effectiveness scores from one year to the next. He found that in the majority of cases the teacher characteristics were not significantly related to teacher effectiveness and that the correlations between various types of effectiveness were generally low. This study suggests that "if a relationship exists between teacher characteristics and teacher effectiveness, then there is a need for more refinement in measuring teacher characteristics as well as a need to look at different teacher characteristics." (23, 44)

The growing evidence that teacher training programs have little effect on public school students' achievement and that student achievement itself is related to a small number of manipulative variables have undoubtedly contributed to a recent trend in teaching research that focuses upon the definition, measurement, and interrelationships of teacher behaviors.

Many researchers have stressed the need to identify the significant components of teacher behaviors. Ryans, on the basis of an extensive survey of the literature, concludes that the descriptive aspects of teaching should be more thoroughly investigated before exploring such a question as teacher effectiveness.

> Teacher evaluation, or the judgements of teacher effectiveness, can be properly and successfully accomplished only when it is based upon reliable knowledge of the essential behaviors involved in teaching and the basic characteristics of teachers.

> Thus, it is appropriate that much of the research being conducted today is concerned with the identification of the behaviors of teachers and with their description rather than proceeding, in the absence of such a base of information, to value considerations. For value concepts and judgements, and the value systems on which they are based, grow out of one's personal biases, preferences, beliefs, opinions, and attitudes; all of which vary substantially from one individual to the next. (47, 292)

There seems to be little indication that behaviors which are judged effective in one content area will be equally judged in another. McKeachie (34) found little resemblance between "successful" French teachers and "successful" psychology teachers. Solomon reported that teachers in one area, such as social sciences, differed from their counterpart in other areas with respect to certain behavioral dimensions, such as "permissiveness," "clarity," and "control." (14) These studies seem to lend support to Ryans' suggestion that

> before teacher effectiveness can be studied properly, a great deal of attention must be given to developing its operational definitions....that spell out the particular, highly specific behaviors that are involved in good teaching from the standpoint of a particular college or school system, teacher group, community, or teacher education faculty. Systematic attention must be given (a) to the designation of expected teacher behaviors and educational goals acceptable to the particular group the teaching will serve and (b) to the characteristics of the teacher that have been identified and for which reliable methods of observation and assessment exist. (47, 292)

Particularly during the last decade, more studies have sought to investigate teaching styles, behaviors, and effectiveness with some regard to this more narrow focus suggested by Ryans.

A study (29) conducted on 101 student teachers in twelve teaching fields at North Texas State University was designed to investigate the relationships among selected personality and achievement predictors and teaching style. The Teaching Style Checklist was devised for the purpose of discriminating three predominate teaching styles - systematic, humanistic, and creative. Students who failed to exhibit a clear teaching style were placed together in a general category.

The results revealed that females were judged consistently higher on each of the three teaching style measures, were rated higher by their college coordinator, and maintained a higher grade point average. Males received a slightly higher student teaching grade. None of these differences were significant, however.

There were no significant differences between the general and systematic teaching styles in grade point averages, college coordinator's ratings, or student teaching grades. The creative teachers were rated significantly higher by their college coordinators and received a significantly higher grade in student teaching than did the humanistic teachers.

Student teachers classified as humanistic were high in their needs for introspection and change and low in their needs for dominance and agression. Creative student teachers demonstrated a high need for achievement. Systematic and humanistic student teachers did not differ significantly from the norm group in their needs. A factor analysis revealed that those students classified as humanistic did, indeed, have similar needs. Those student teachers classified as

creative had need structures that differed from the other categories and they also tended to differ from each other. (29)

An experiment reported by Klein (30) indicated that teacher behaviors are influenced by student classroom behaviors. Two guest speakers were randomly assigned to experimental sequences composed of positive, negative and natural student behaviors. The students smiled, looked attentively at the teacher, and answered the teacher's questions quickly and correctly during the positive treatment periods; they frowned, looked out the window, and talked with classmates during periods of negative student behavior. The verbal and non-verbal data analyses revealed that teacher behavior was positive when the students were positive and negative when the students were negative.

Studies (8) conducted at the University of Florida investigating the nature of the helping relationship have consistently indicated that the effective helpers saw people from the inside rather than the outside, were more sensitive to student feelings, more concerned with people than things, and viewed themselves and others as able, worthy, and dependable. Objectivity has correlated negatively with effectiveness as a helper; the effective teachers see the teaching task as one of freeing and assisting, rather than controlling or coercing.

A doctoral study conducted by Robitaille (43) resulted in findings more positive than most others in identifying effective teachers and their accompanying behavioral characteristics. From a population of one hundred sixty-seven teachers of secondary mathematics,

twenty-three highly effective and twenty minimally effective teachers were identified by the independent ratings of four observers. These selected teachers completed a questionnaire and a number of tests measuring such factors as their competence in contemporary high school mathematics, attitudes toward teaching, school administration, and the community, knowledge of methodology, perceptions of their pupils, age, academic qualifications, and years of teaching experience. The first phase of the study involved the use of the discriminant analysis technique on the results of the testing program in order to again classify the selected teachers as highly effective or minimally effective. It was found that the teachers could be classified almost as well by the testing program as by the effectiveness ratings; forty-one of the total forty-three members of the two samples were classified correctly using this technique.

For the second phase of the study, a Check List of teacher behaviors was developed in order to test the hypothesis that the more effective teacher would behave in ways designed to encourage pupil participation significantly more often than the less effective teacher. This hypothesis was supported at the .05 significance level. It was also found that the highly effective teachers asked more "thought-provoking" questions than the least effective teachers. They praised their pupils more often, more frequently encouraged pupils to contribute to the class, and had significantly fewer negative occurrences of items

on the Check List. The single best discriminator between the two groups was the individual's score on Massie's test of contemporary mathematics. (This instrument was also used in the present study.)

Robitaille's study indicates that significant research into teacher effectiveness can be obtained through small-scale research projects. The limitation of homogeneous grouping may have contributed to the significant differences found between the verbal behavior of ineffective and effective mathematics teachers.

Although relatively little is known for certain about teacher characteristics and behaviors relating to teaching effectiveness, the above studies and others presented in reviews by Ryans (47), Getzels (24), and Kleinman (31) have provided summaries of the generalizations that seem appropriate.

Ryans (47, 293) has indicated that intellectual abilities, college achievement, subject matter knowledge, general cultural knowledge, knowledge of professional information, student teaching marks, estimated emotional adjustment, attitude favorable to students, generosity and tolerance in appraising other's behavior, strong interest in reading and literature, interest in music and painting, participation in social and community affairs, early experiences in caring for children and teaching, family history of teaching, size of school and community where teaching, cultural level of the community, and participation by the teacher in avocational activities all appear to be characteristics of the teacher that are likely to be positively correlated or associated with teacher effectiveness. The age of the teacher and the amount

of teaching experience (except during early years of teaching) seem to show an over-all negative relationship with most teacher effectiveness criteria. At the secondary level there is some evidence that women as a group may be more effective than men as a group on specified criterion dimensions. There seems to be little difference in the teaching behaviors of single and married teachers.

Ryans (47, 293) states that the correlations frequently have not been high. He warns that the relationships and differences are in terms of averages for groups of teachers and may not be particularly helpful in predicting an individual's effectiveness.

To search for teacher characteristics and background data that are significantly related to certain teacher behaviors and attitudes, such as activities and strategies of secondary mathematics teaching, attitudes toward and knowledge of the culturally disadvantaged, and reactions to general teaching situations, was one of the objectives of the present study.

## Reliability of Pupil Evaluation

Much of the research concerning teacher characteristics and effectiveness has involved quantitatively described teacher classroom behavior. Frequently, behavioral data on teachers have been obtained through systematic coding or rating by trained adult observers of one or more classroom sessions. More recently, teacher behaviors have been recorded or video-taped for later analysis. Both of these valuable techniques are limited as samples of teacher behavior under

"normal" conditions. "What is needed for many research purposes is a reliable description of the typical behavior of the teacher, based on many hours of classroom observation. The obvious sources for such data are the pupils." (59, 103)

Veldman and Peck have argued that student evaluations are, on the average, no less objective than those of adults and offer the advantages of being based on a much more comprehensive sample of observed behavior. The effects of biased ratings are minimized by having a large number of students as judges. (59) (62)

There are possible sources of systematic biases or errors in pupil evaluations of teachers. These could be due to the sex and social class level of the pupils, the grade level and subject-matter area of the class, or the sex of the teacher being evaluated. Three studies by Veldman and Peck investigate some of these possible sources of influence on pupil evaluations of teachers.

The first study (62) investigated the possibility of systematic sex biases in pupils' reactions, such as girls favoring men teachers over women teachers or vice versa, or that boys show such a bias. The Pupil Observation Survey Report, a 38-item questionnaire developed by the staff of the Mental Health In Teacher Education Project, was used to sample eleven aspects of teacher behavior in the classes of forty-eight male and one hundred forty-nine female student teachers. The scales included nine aspects of teacher behavior and two general estimates of approval. These were: (1) Identification Model, (2) Interesting Presentations, (3) Firmness and Respect, (4) Systematic

Control, (5) Poise and Self-confidence, (6) Friendliness and Interest, (7) Knowledge of Subject, (8) Democratic Procedure, (9) Optimism and Cheerfulness, (10) The best teacher I ever had, and (11) I wish all my teachers were like him (her). Each student teacher had three sets of eleven scores - one from the boys, one from the girls, and one from the total group.

In order to determine the effects of these variables, thirty-four male and thirty-four female student teachers were selected as subjects. The analysis of the scores from their classes, each having more than five pupils of each sex, revealed that of the thirty-three ways in which a sex bias could show itself, only four actually demonstrated a sex-linked bias. The researchers stated that

> There is no evidence in the present study that high school pupils prefer teachers of either sex over the other or that they consider teachers of either sex to be more poised, systematic, or knowledgeable about the subject matter. In the present sample, the pupils did consider the female student teachers to be, on the average, more cheerful than the male student teachers, and there was a tendency for them to regard female student teachers as more friendly, more interested in them and more democratic in their teaching procedures. Our knowledge of the student teachers from other sources suggests that the pupils may be rather accurately describing a real difference in the behavior of female student teachers as compared with the male student teachers in this population. (62, 396)

There was no apparent distortion in the pupil's descriptions of their student teacher's behavior due to a subjective preference of boys for male teachers, girls for female teachers or the opposite. Veldman and Peck concluded that

> The over-all findings of this study suggest that pupil evaluations of teaching behavior and teaching effectiveness are not severely biased by an irrelevant predisposition to prefer one sex over the other. Since the factor of sex similarity could be expected to be among the most emotionally potent influences which might distort perceptions of teacher behavior, the lack of such distortion suggests that pupil evaluations deserve further study as a major criterion measure in studies of teacher personalities and teaching behavior. (62, 396)

The evaluation of five hundred fifty-four secondary student teachers from the University of Texas were factor analyzed in the second study (61). The Pupil Observation Survey Report (POSR) was again used. The five factors extracted were: (I) Friendly, Cheerful, Admired; (II) Poised, Knowledgeable; (III) Interesting, Preferred; (IV) Strict Control; and (V) Democratic Procedure, Nondirective. The factor structure was demonstrated to be invariant across the analyses of the three semester subsamples. Factor structures were also obtained separately for the two sexes; except for minor variations, the factor structures appeared to be almost identical. The results of analyses of variance comparing the factor scores of male and female teachers indicated that female teachers were higher on Dimensions I and V. The researchers felt that these significant differences were consistent with the role expectations in our culture; women are commonly considered to be more warm, exuberant, and permissive in their relationships with the young. The correlations with two attitude inventories were low but significant. The relationships of factor-scores to supervisor-rated effectiveness were linear and positive for Factors I, II, and IV, except for a curvilinear effect

with males on Factor I. Also one or another of the factors appeared to closely correspond to each of the three patterns identified by Ryans in his Teacher Characteristics Study (46). This suggests that pupils can provide at least as much information regarding teacher characteristics as can expert adult judges on the basis of one or two hours of observation. (61, 354)

The last of the studies to be reported in this section continued the use of the Pupil Observation Survey Report (POSR) and its five isolated factors described above. A sixth factor called "General Evaluation" was added and then five potentially significant types of information were included in a series of regression analyses of covariance. These categories were the grade in student teaching, the grade level of the class (each of the levels 7-12 was represented), the subject-matter area, the socio-economic level of the school, and the sex of the student teacher. The sample was comprised of six hundred nine student teachers in the Austin, Texas area.

The pupils and the university supervisors agreed to a significant extent regarding the general effectiveness of the student teachers. Only two of the six factor variables were significantly related to the grade level of the class; junior high school students - particularly seventh graders - considered their student teachers to be less friendly and cheerful, but more lively and interesting than did senior high school students. The POSR factors, particularly those of III and IV, were heavily influenced by the subject matter area; the teacher characteristics for the mathematics and science areas were

summarized as friendly, dull, directive, and uncontrolled. Only one factor (III) was markedly influenced by the socio-economic level of the school. The researchers concluded that such aspects as the grade level of the class or the socio-economic level of the school do not badly bias the POSR scores. However, the data clearly indicated that the subject matter has a powerful influence. Research applications of the POSR technique should either confine comparisons to teachers of a single subject or include subject matter as an additional design variable. (59, 107)

The above studies by Veldman and Peck offer evidence indicating that students can make reliable judgements concerning student teachers. Information obtained from students appears to discriminate between student teachers, particularly when the student teachers are working in a single subject-matter area.

## Influence of the Cooperating Teacher on the Student Teacher

Sagness (48, 27-29) has reviewed a number of studies that suggest a strong relationship between the characteristics of the cooperating teacher and the student teacher. This section reviews several other studies which investigate the cooperating teacher's influence on the attitudes or behaviors of student teachers.

Scott and Brinkley found that student teachers whose initial scores on the Minnesota Teacher Attitude Inventory (MTAI) were inferior to those of their cooperating teachers improved significantly

while those whose initial scores excelled their cooperating teacher's failed to make significant gains. There was a relationship between the attitude change of student teachers and the attitudes of their cooperating teachers, but only for those student teachers having lower initial scores than those of their cooperating teachers. (50, 77) In another study using the MTAI, Dutton found that the attitude change of student teachers was in the direction of the cooperating teacher regardless of initial scores. (18, 381)

Bills, Macagnoni, and Elliot (6) found that the changes in openness among a group of student teachers were significantly related to the openness of their cooperating teachers but not to that of their college supervisors.

Veldman (60) conducted a study designed to investigate the relationships between pupil evaluations of student teachers and pupil evaluation of cooperating teachers. He sought relevant data on two questions: (1) Do student teachers and cooperating teachers differ in their average levels of evaluation by pupils? (2) Is there a correlation between the evaluations by pupils of student teachers and their cooperating teachers? The pupils in fifty-five seventh grade classes in Austin were asked to complete the Pupil Observation Survey Report (POSR) twice - once to describe their regular teacher; and once to describe the student teacher assigned there for a semester. All participating teachers were female. The results of the analyses pertaining to the first question showed that there were substantial differences in the way pupils perceived the student teachers and their

supervisors. The cooperating teachers were considered less friendly and cheerful, less lively and interesting, more poised and knowledgeable, more firmly controlling, and somewhat less directive than the student teachers assigned to them. There was a tendency for pupils to prefer the student teachers over their cooperating teachers, but it was not statistically significant.

The correlation coefficients used to answer the second question were computed for each of the POSR factor variables. The correlations for the categories of Friendly and Cheerful, Knowledgeable and Poised, Lively and Interesting, and General Evaluation were not significant. Those for the Firm Control and Nondirective categories were significant. Veldman concluded that

> If we accept the reports of the pupils as valid descriptions of the classroom behavior concerned, there is no evidence that supervisors influence the behavior of their student teachers appreciably. There is, however, evidence to support the idea that they set the classroom atmosphere with regard to the structure of class activities and student participation, since student teachers do not begin to teach until a few weeks after the semester has begun and such parameters have been established by the supervising teacher. (60, 167)

A doctoral study reported by Bemado (4) investigated the cultural backgrounds of student and cooperating teachers. A sixteen-item questionnaire was designed to elicit information concerning the family background, educational training, and activities of the student and cooperating teachers. The Allport-Vernon-Lindzey Study of Values Test supplemented information obtained from the Personal Data Questionnaire. The MTAI was adopted to measure the students' and cooperating

teachers' attitudes toward children. A Student Teacher Achievement Scale by Roisi was used to rate the achievement of the students. The population consisted of sixty-five student-cooperating teacher pairs in Pennsylvania. It was found at the .01 level of confidence, that a greater number of problems were reported by cooperating teachers when their cultural backgrounds were quite different from their student teacher's. It was concluded that cultural backgrounds should be considered when pairing student teachers with cooperating teachers.

Price (40) reported a study in which Sanders' Observation Schedule was used to classify both student and cooperating teachers. Each group of teachers was subdivided according to high, middle, and low ratings. Student teachers from each of the classified types were placed with cooperating teachers of each type giving all nine possible combinations of pairings. Attitude changes were measured using the Minnesota Teacher Attitude Inventory. The results indicated that a considerable change in student teachers' attitudes occurred during the student teaching semester. There was a tendency for their attitudes to change in the direction of the attitudes held by their respective cooperating teachers.

> Probably one of the most significant conclusions of the study was that the correlation between supervising teachers' and student teachers' classroom teaching performances indicated that student teachers seem to acquire many of the teaching practices of their supervising teachers during the internship semester. The most logical conclusion from this finding reinforces the belief that only the best available teachers should be used in student teaching programs. (40, 475)

## Criticisms of Student Teaching

There is a growing body of literature and research which is critical of the practice teaching experience. Silberman, in Crisis in the Classroom, has stated that practice teaching may even be harmful.

> To the extent to which they value any aspect of their professional education, teachers generally cite practice teaching as the most valuable-sometimes the only valuable-part. Critics of teacher education, too, all agree that whatever else might be dispensable, practice teaching is not. But these judgements provide no basis for complacency, or even satisfaction. Compared with the kind of clinical training teachers should and could receive, practice teaching falls woefully short of the mark.
>
> In some respects, in fact, practice teaching may do more harm than good, confirming students in bad teaching habits rather than training them in good ones. (51, 451)

Goodlad has also indicated a concern that student teaching is generally and distantly removed from being a professional experience.

> Student teaching is usually the climax of the preservice phase of teacher preparation, the point at which school and college personnel should assure themselves that the neophyte is a promising inquirer into and practitioner of teaching. But the cards are stacked in favor of his controlling habits becoming fixed with little reference to principles of pedagogy. The student teacher's need to survive, together with the cooperating teacher's need to have him survive, are powerful factors adding to other factors favoring early closure on survival skills. (25, 266)

Sorenson (55) has described a study which supports the above views, particularly those of Goodlad. One hundred sixty-three secondary education students, at the end of their eighth week of practice

teaching, were asked to list those things they would tell their best friend in order to get an A grade from their supervising teacher. The researcher classified most of the eight hundred suggestions into nine categories. The most common category dealt with the student teacher's relationship to his supervising teacher. Forty per cent of the student teachers recommended listening very carefully to the supervising teacher's suggestions and following them without question. The next most frequent responses concerned the importance of lesson plans, classroom control, and specific ways of conducting a class. The researcher concluded that most student teachers feel a need to conform to the demands of the existing system and that a great gap exists between the content of professional courses and the activities of student teaching. In addition, Sorenson indicated that practice teaching did not appear to provide the prospective teacher with a theoretical framework for use in planning and evaluating his own instructional activities; the entire emphasis seemed to be on the learning of routines for getting through the day rather than on the analysis of the reasons for or the effectiveness of these routines. (55, 177)

Several studies have indicated that student teachers' attitudes change in a negative direction during student teaching. Osmon (39) used the Minnesota Teaching Attitude Inventory to measure the attitudes of two hundred twenty-two secondary student teachers before and at the end of the student teaching experience. The t-test revealed that the mean MTAI scores for all students showed a loss at less than the .01

level of confidence. Studies by Dutton (18), Mitzel and Aikman (35), Corrigan and Griswold (10), and Bowman (7) report similar results.

Grey and Greenblatt (27), found some tendency for student teachers to perceive child behavior more negatively at the end of the term. Bills, Macagnoni, and Elliot (6) found a decrease in openness among a group of student teachers at the completion of their experience.

## Experimental Teacher Education Programs

This section presents a description and/or an evaluation of four teacher education programs which have a relationship to the program or the design (or both) of the present study. A more thorough review of research involving early in-school experiences and urban settings is given in Sagness (48, 32-38).

A program conducted and evaluated by Sandefur (49) at Kansas State Teachers College tested the proposition that valid content in teacher education could be best achieved through the integration of professional content and companion laboratory experiences. The criteria for the development of the experimental program were: (1) that the content of professional education would be integrated into either a problem or a thematic approach, (2) that laboratory experiences of observation and participation would keep pace with the study of content, and (3) that new techniques and media which

represented the best that was known about teaching and learning would be used in the presentation of both the content and the laboratory experiences.

The experimental program replaced the formal courses of professional education with three phases of professional preparation. These were based upon an unstructured study of content in conjunction with carefully planned laboratory experiences. The three phases were: (1) Observation (first semester - junior year), (2) Participation (second semester - junior year), and (3) Student teaching (first or second semester - senior year).

Observation was accomplished by means of a closed-circuit television system in the campus laboratory school. Readings and seminars accompanied the observation. During the second phase, the pre-service teacher spent one hour daily in a high school class of his major area assisting in planning, preparing instructional materials, directing small groups, and instructing class at the request of the supervising teacher. The last phase consisted of full-time public school teaching for one-half of a semester. The readings and seminars were continued.

A conventional program was operated concurrently and used the more traditional sequence of theory and methods courses.

For the evaluation of the program, sixty-two students were randomly assigned to the project and fifty-three to the conventional program. All data collected were designed to reveal behavioral rather than factual information. The data were derived from (1) The Classroom Observation Record, (2) a system of interaction analysis,

(3) the National Teachers Examination, and (4) grades earned in student teaching.

The major conclusions were that: (1) there was a significant difference in the teaching behaviors of the experimental and control groups as measured by the Classroom Observation Record - the experimental group received the more desirable behavior ratings; (2) there was a significant difference in pupil behavior of the two groups with the more desirable ratings being given to the pupils of the experimental teachers; (3) there was a significant difference in the teaching pattern of the experimental and control groups using the sixteen-category system of interaction analysis. The experimental group used significantly more direct activity; (4) the grades earned in student teaching were significantly higher for the experimental students; and (5) significantly higher scores were made on the Professional Education section of the National Teachers Exam by the control group.

The following related conclusions were also made:

(1) The control group learned more facts as measured by the NTE yet their teaching behavior tended to be more traditional and less desirable as judged by qualified independent observers. It was concluded that possessing factual information about the professional content of teacher education was not sufficient to alter teaching behavior.

(2) Behavioral changes of prospective teachers can be more readily induced by programs of professional education which stress

direct involvement of the prospective teacher in the teaching-learning process through meaningful laboratory experiences made relevant to content and theory.

(3) Prospective teachers can be sensitized to the use of certain desirable teaching actions such as the use of praise and the acceptance of student's ideas through a planned professional program utilizing demonstration, observation and participation.

In the opinion of the investigators, the experimental program's democratic involvement process (incorporating constant effort to reduce classroom tensions and threats, persistent effort to recognize individual worth and dignity, efforts to assure internal rather than external or imposed motivation, and constant use of student involvement in the teaching-learning process) was the most significant factor in influencing the behavior of the prospective teachers.

A program at the University of Illinois has been much concerned recently with the notion of clinical training in teacher education. This approach is problem centered and gives training in solving these problems within the context of actual teaching situations.

Travers (58) indicates that this program is characterized by the following:

(1) A commitment to the notion of genuine cooperation with the schools in the design and conduct of the program gives a broad basis for providing input and delegating responsibility.

(2) The project attempts to provide continuity of professional education by bridging the gap between pre- and postcertification.

The student teacher (full responsibility for eight - ten weeks) is not responsible to an individual teacher or supervisor, but to the department and in particular to a teacher education team within that department. Beginning teachers, also, may be members of a professional team rather than left to shift for themselves.

(3) There is a team approach to professional education. Seminars are held regularly in which an experienced teacher joins forces with a teacher educator from the university in deliberations of topics. An educational psychologist may be present also. Student teachers and, when possible, second or third year teacher education students, may also be members of the professional team.

(4) The project is designed to provide the student teacher with a broad spectrum of teaching experiences, from elementary to senior high and from low-achieving to advanced classes.

(5) Deliberate attempts are made to suit the training experience to the individualized interests and needs of the candidates.

(6) An important feature of the first few weeks of the training program is small group instruction called "mini teaching."

The training program for the teaching candidates comprises sixteen weeks of experiences conducted entirely "on location" in northwest suburban Chicago.

The mornings for the first three weeks are devoted primarily to one class of mini teaching and to related activities (planning, discussion, observation). During the afternoons, considerable time is spent on observation of other classes in the mathematics department,

other teaching areas, and in other schools (including elementary, and junior high schools). Other afternoon activities include seminars, observation, and lectures involving techniques and strategies.

The student teachers spend two full days in a school which employs modular scheduling. During the first day each student teacher will "shadow" a high school student to gain some insight concerning the experience of students in schools using this administrative procedure.

The remainder of the semester is devoted to more sustained teaching in the schools. Student teachers work within departments, assuming more and more responsibility for the progress of selected classes.

Although no formal evaluation was reported, Travers indicated that the project has done much to bridge the credibility gap between the schools and teacher education colleges. (58, 8)

The Cooperative Urban Teacher Education (CUTE) Program is a joint effort of institutions in Missouri and Kansas, the public school systems of Kansas City, and the Mid-continent Regional Educational Laboratory (McREL). The program is concerned with providing adequate education for underpriviledged children and with preparing teachers who will be adequate for the special demands of inner city teaching.

In developing the curriculum for the CUTE Program, it was assumed that a prospective teacher would be successful if he: (1) understood himself as a person influenced by experiences, socio-economic background, and personal needs; (2) perceived his pupils as

individuals influenced by experiences, socio-economic background, and personal needs; and (3) was knowledgeable and competent in instructional skills which appeared to self-directed learning. Accordingly, an instructional team composed of a psychiatrist, sociologist, and two teacher educators determined what content would be appropriate within the areas of mental health, sociology, and teacher education.

The initial evaluation of the CUTE program was primarily concerned with the behavioral and attitudinal growth of its students. Although a host of instruments was used in this preliminary evaluation, only the data relating to the Cultural Attitude Inventory (CAI) will be discussed, since the present study also used this instrument developed by Skeel (53).

During the student teaching quarter, the CUTE students significantly (.01 level) increased their CAI scores indicating that they grew with respect to their knowledge and attitudes about culturally disadvantaged children. The CUTE student teachers also had CAI scores significantly higher than those of all comparison groups. It was concluded that the CUTE program was effective in achieving the goal of teacher compatibility for culturally deprived schools.

The authors summarized their CUTE report by indicating that "the results indicate substantial support for the notion that CUTE students became a breed apart from the conventionally educated teacher. They became beginning teachers with special skills, understanding, and attitudes which should make them more effective teachers of inner-city children." (63, 132)

A doctoral study, which has particular relevance to the present study due to its similarity in design and instrumentation, was conducted by Sagness (48) during 1969-70 at The Ohio State University. He investigated and compared two pre-service teacher education programs in secondary science education. These programs were developed in conjunction with similar programs in secondary mathematics education. One program, the project, emphasized classroom participation prior to student teaching in two schools (urban and suburban) having contrasting environmental settings. Student teaching also occurred in two schools having contrasting environmental settings. The other program, the non-project, was developed principally around university-based courses with few participatory public school experiences prior to student teaching. Student teaching was done in one school.

The quarter (n=64) preceding student teaching and the student teaching quarter (n=34) were investigated in terms of the criterion variables: the pre-service teachers' views of activities which should be used for science instruction in an urban setting, those which should be used in a suburban setting, the activities the pre-service teachers used for instruction during student teaching, the pre-service teachers' attitude toward culturally deprived students, and their knowledge of culturally deprived students. The instruments used to measure these variables were the Science Classroom Activities Checklist: Teacher Perceptions (SCACL-TP), the Science Classroom

Activities Checklist: Pupils' Perceptions (SCACL:PP), and the Cultural Attitude Inventory (CAI).

Sagness found that at the completion of the first quarter the project participants had significantly higher SCACL:TP "Urban" scores than at the beginning of the quarter. Significant changes were found for the non-project group in the direction of lower scores on the CAI composite and the CAI attitude measures.

The project and non-project participants did not differ significantly in their views of activities which should be used for science instruction in an urban setting at the completion of the first professional quarter, but the two groups did differ significantly in their views of activities which should be used for instruction in the suburban classroom. The project participants had higher "suburban" checklist scores, particularly on the subscales dealing with science laboratory activities.

Another pre-student teaching finding was that the pre-service teachers' age correlated negatively with scores on the SCACL:TP "Urban" posttest and with the posttest scores on the CAI attitude subscale.

During the student teaching quarter the project pre-service teachers significantly changed their views of the activities which should be used for science instruction in an urban setting, whereas the non-project participants did not. The project teachers held a more restrictive view of the activities thought to implement science instruction in an urban setting. There were no significant changes

in or differences between the two groups on the "suburban" checklist scores.

The project student teachers did not change significantly in their compatibility to work in culturally deprived schools by the end of the student teaching experience. The non-project student teachers exhibited a significant change on this variable. Sagness was unable to determine whether project and non-project student teachers differed significantly in their compatibility to work in culturally deprived schools by the end of the student teaching quarter. He concluded that the project student teachers had greater knowledge of culturally deprived students at the completion of the student teaching experience, but that this was primarily a function of knowledge brought into student teaching from the first professional quarter.

Sagness noted that project student teachers used fewer of the types of activities thought to implement the general objectives of science education than did non-project student teachers. He concluded that "the most significant influence on the activities used by student teachers for science instruction during student teaching was the cooperating teacher." (48, 184) He concludes that

> project participants did compare favorably with non-project participants for the first professional quarter. The project participants appeared to be very successful in meeting a major program objective, that of increased knowledge of culturally deprived students.
>
> Further inspection of the data indicated that project student teachers had not maintained their first professional gains, other than on the knowledge of culturally deprived students variable,

at the completion of the student teaching experience. These regressions were greater than could be accounted for by the usual regression toward the mean. It would appear that the project student teaching experience had some influence on these losses. (48, 184-5)

# CHAPTER III

## RESEARCH DESIGN AND METHODOLOGY

The design and methodology of the study are presented in this chapter. The population and samples, the instrumentation, the procedures, and the statistical programs used are described.

### Population and Samples

The population was comprised of pre-service teachers in secondary mathematics education at The Ohio State University, and teachers and students of the Columbus metropolitan area schools.

The pre-service teacher sample consisted of both project and non-project students who enrolled for senior level work during the academic year 1970-71. These prospective teachers were not randomly chosen, nor were they randomly assigned to either of the two teacher education programs. The major criteria for entrance into the project were the students' desire to do so and the feasibility of meeting graduation and/or certification requirements. Table 1 indicates the distribution of the pre-service teachers by program categories and quarter.

Table 1

DISTRIBUTION OF PRE-SERVICE TEACHERS

BY PROGRAM CATEGORIES AND QUARTER

| | Autumn | | Winter | | Spring | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | *P | NP | P | NP | P | NP | P | NP |
| Pre-Student Teaching Block | 22 | 0 | 30 | 0 | 0 | 0 | 52 | 0 |
| Student Teaching | 0 | 9 | 16 | 4 | 32 | 10 | 48 | 23 |

* P= Project
NP= Non-project

The project pre-service teachers were all enrolled in the pre-student teaching block during either the autumn or winter quarter and most were enrolled for student teaching during the winter or spring quarter. There were a total of fifty-two project students. The fall group was comprised of thirteen males and nine females; the winter group consisted of twenty-two males and eight females. Additional characteristics of the two project groups during the pre-student teaching block are described in Table 2.

Table 2

SELECTED CHARACTERISTICS OF PROJECT PRE-SERVICE TEACHERS DURING THE PRE-STUDENT TEACHING BLOCK

| | Fall(n=22) | | Winter(n=30) | | Total(n=52) | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Age | 21.86 | 2.25 | 21.83 | 2.00 | 21.85 | 2.09 |
| ACT Composite Percentile | 63.50 | 31.78 | 73.17 | 21.51 | 69.30 | 26.03 |
| ACT Math Percentile | 78.92 | 17.61 | 80.71 | 15.04 | 79.97 | 15.87 |
| Massie's Math Test | 27.00 | 6.40 | 27.70 | 4.57 | 27.40 | 5.37 |
| GPA* (before entering education) | 2.85 | .56 | 2.87 | .47 | 2.86 | .50 |
| GPA in Math (post-calculus courses) | 2.95 | .69 | 2.91 | .59 | 2.93 | .63 |
| GPA in Pre-Student Teaching Block | 3.31 | .55 | 3.06 | .41 | 3.16 | .48 |

* All grade point averages are based on a four-point scale.

Although most of the twenty-two fall quarter project students participated in student teaching during the winter quarter, six delayed this experience until the spring quarter. Four of the thirty members of the winter project group were not included in the spring sample of student teachers; three did not enroll for student teaching during the spring quarter and one chose to do student teaching outside the Columbus metropolitan area.

The non-project student teachers complete the student teaching population. All of the twenty-three students who participated in student teaching during one of the fall, winter, or spring quarters but did not participate in the project were included in this study.

For both the project and non-project student teachers, the ratio of males to females was about 2 to 1. The ratio was 32 to 16 for the project group, 16 to 7 for the non-project group, and 48 to 23 for the total student teaching sample. Table 3 presents additional descriptive data for the project, non-project, and combined groups of student teachers.

Table 3

SELECTED CHARACTERISTICS OF PRE-SERVICE TEACHERS DURING THE STUDENT TEACHING QUARTER

| | Project | | Non-project | | Total | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Age | 21.96 | 2.13 | 21.57 | .84 | 21.83 | 1.82 |
| ACT Composite Percentile | 68.52 | 26.89 | 75.63 | 15.70 | 71.46 | 23.00 |
| ACT Math Percentile | 79.78 | 16.35 | 85.25 | 9.98 | 81.81 | 14.43 |
| Massie's Math Test | 27.38 | 5.48 | 24.78 | 5.01 | 26.54 | 5.44 |
| GPA (before entering education) | 2.85 | .51 | 2.94 | .42 | 2.88 | .49 |
| GPA (before entering student teaching) | 3.15 | .43 | 3.12 | .40 | 3.14 | .42 |
| GPA in Math (post-calculus courses | 2.92 | .62 | 2.74 | .61 | 2.86 | .62 |

The student teachers were not randomly assigned to schools or to cooperating teachers. The characteristics of the student teacher, the cooperating teacher, and the school were considered in making assignments. In some cases, a project teacher did his student teaching in one of the two schools in which he had participated during the pre-student teaching block, and in several instances, worked under the direction of one of the same mathematics teachers. In fact, during the pre-student teaching block, the project teachers and the mathematics teachers with whom they worked were asked to consider the possibility of working together during the student teaching quarter. There were three instances of project and non-project student teachers at the same school during the same quarter.

The teacher sample for this study consisted of the cooperating teachers in the Columbus vicinity who worked directly with a project or a non-project prospective teacher during his student teaching quarter. There were twenty-three non-project and forty-eight project cooperating teachers. The seventy-one cooperating teachers were matched one-to-one with the seventy-one student teachers, except in two instances; one cooperating teacher had two project student teachers (but during different quarters and in different classes), and one project student teacher had two cooperating teachers. Additional statistics of the project, non-project, and total cooperating teacher samples are given in Table 4.

Table 4

SELECTED CHARACTERISTICS OF COOPERATING TEACHERS DURING THE STUDENT TEACHING QUARTER

| | Project | | Non-project | | Total | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Age | 33.47 | 10.70 | 33.07 | 10.45 | 33.38 | 10.56 |
| Years Of Experience | 8.67 | 7.65 | 10.00 | 7.90 | 8.97 | 7.66 |
| No. Of Student Teachers | 3.65 | 4.01 | 3.92 | 2.99 | 3.71 | 3.79 |
| Years Of Teaching Math | 8.32 | 7.15 | 9.93 | 7.76 | 8.68 | 7.26 |
| Undergraduate Qtr. Hours In Math | 47.55 | 27.04 | 47.69 | 7.59 | 47.58 | 23.83 |
| Graduate Qtr. Hours In Education | 17.36 | 20.07 | 19.46 | 21.46 | 17.85 | 20.22 |
| Graduate Qtr. Hours In Math | 10.84 | 17.52 | 7.00 | 11.08 | 9.96 | 16.27 |
| Year Last Studied Math | 66.53 | 3.78 | 64.21 | 10.02 | 66.00 | 5.80 |
| No. Of Classes Taught Per Day | 5.37 | .76 | 5.79 | .80 | 5.46 | .78 |

The twenty-six schools that participated in the student teaching program were all located in the Columbus metropolitan area but did not all belong to the same school system. The Upper Arlington, Bexley, Columbus, Southwestern, and Worthington school districts each had secondary student teachers in mathematics during at least one of the three quarters of the 1970-71 school year. However, the majority

of schools belonged to the Columbus district. The schools within each district were classified as urban (inner city), intermediate, or suburban (outer city) according to whether the school percentage of students on Federal Aid to Dependent Children was less than 5%, between 5% and 20%, or greater than 20%, respectively. All of the urban and intermediate schools having student teachers during this period belonged to the Columbus district. Table 5 shows the distribution of schools and classes for student teaching by kind-of-school (urban, intermediate, and suburban) and program (project, non-project) classifications.

Table 5

DISTRIBUTION OF SCHOOLS AND CLASSES

BY PROGRAM AND KIND-OF-SCHOOL CLASSIFICATIONS

FOR THE STUDENT TEACHING QUARTER

| | Project | | Non-project | | Totals | |
|---|---|---|---|---|---|---|
| | Schools | Classes | Schools | Classes | Schools | Classes |
| Urban | 5 | 30 | 2 | 5 | 5 | 35 |
| Intermediate | 2 | 13 | 1 | 4 | 3 | 17 |
| Suburban | 12 | 66 | 10 | 39 | 18 | 105 |
| Totals | 19 | 109 | 13 | 48 | 26 | 157 |

The distribution of these 157 classes (totaling more than 3,458 students) by subject area, program, and kind-of-school classification is indicated in Table 6.

Table 6

DISTRIBUTION OF CLASSES BY SUBJECT AREA, PROGRAM, AND KIND-OF-SCHOOL CLASSIFICATIONS FOR THE STUDENT TEACHING QUARTER

| | Project Classes | | | | Non-project Classes | | | |
|---|---|---|---|---|---|---|---|---|
| | Urb | Int | Sub | Totals | Urb | Int | Sub | Totals |
| Math 7 | 4 | 3 | 9 | 16 | | | 2 | 2 |
| Math 8 | 5 | 5 | 12 | 22 | | | 3 | 5 |
| General Math | 10 | | 14 | 24 | 4 | 2 | 4 | 10 |
| Applied Math | 2 | | | 2 | | | 1 | 1 |
| Shop Math | | 1 | | 1 | | | | |
| Algebra I | 4 | 2 | 8 | 14 | 1 | | 9 | 10 |
| Geometry | 3 | 1 | 12 | 16 | | | 11 | 11 |
| Algebra II | 2 | 1 | 6 | 9 | | | 6 | 6 |
| Trigonometry & Analytic Geometry | | | 5 | 5 | | | 1 | 1 |
| Math V | | | | | | | 2 | 2 |

## Instruments Used in the Study

One of the objectives of this study was to develop two integrally related instruments dealing specifically with the teaching of secondary school mathematics. One instrument, the Mathematics Teaching Inventory: Teacher Perceptions was designed to determine what the teacher feels should occur during selected aspects of secondary

mathematics teaching; the other, the Mathematics Teaching Inventory: Student Perceptions, was designed to provide data on what the students say actually occurs during selected aspects of secondary mathematics teaching. These and other instruments used in this study are described in this section.

Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP)

This instrument was developed by the researcher in conjunction with members of The Ohio State University faculty of mathematics education and a fellow researcher, Clinton Erb. It was patterned after a similar instrument developed for science education by Richard L. Sagness (48, 207). The purpose of this inventory is to provide information concerning the activities and strategies the respondent feels should be used in the teaching of secondary school mathematics. Appendix A, p. 153, contains the version of this instrument used in the present study.

The design of the MTI:TP provided for four subscales contributing to a composite score and a fifth subscale not included in the composite score. The five subscales are: (A) Perceptions of Teacher-Pupil Roles, (B) Use of the Textbook, (C) Design and Use of Tests, (D) Strategies of Teaching Mathematics, and (E) Mathematical Orientation. The first three subscales were patterned after similar scales used in Sagness' Science Classroom Activities Checklist (48) and have some items in common with his subscales. The fourth subscale, Strategies of Teaching Mathematics, contains items more directly related to the content and methodology of teaching mathematics.

The last subscale, Mathematical Orientation, has items which classify the respondent's view of mathematics as utilitarian or disciplinarian. The items belonging to the various subscales are identified in Appendix A, p. 158.

Preliminary versions of the MTI:TP were submitted to several faculty members and graduate students of mathematics and mathematics education for their criticisms. The instrument was revised twice and then submitted to four members of the Faculty of Science and Mathematics Education at The Ohio State University for validation. Complete agreement with each other, this researcher, and a fellow researcher was attained on forty-nine of the fifty-six items; five out of these six persons were in agreement on the remaining statements (items 3, 6, 27, 34, 41, 42, 55) except for item 41 on which only four of the six concurred. For the purposes of this study, all of the fifty-six items were included in the data analyses.

Reliability estimates on the revised instrument were obtained using the Kuder-Richardson 20 formula. Table 7 presents a summary of these estimates computed from the scores of several teacher samples.

Table 7

KUDER-RICHARDSON 20 RELIABILITY ESTIMATES FOR THE MATHEMATICS TEACHING INVENTORY: TEACHER PERCEPTIONS

| Sample | Pre-Post | N | KR-20 Estimate |
|---|---|---|---|
| $S_1$ Project Teachers | Pretest | 52 | .615 |
| $S_1$ Project Teachers | Posttest | 52 | .585 |
| Student Teachers | Posttest | 71 | .712 |
| Cooperating Teachers | Pretest | 63 | .755 |
| Cooperating Teachers | Posttest | 72 | .776 |

The respondent has the options of strongly agree (SA), basically agree (A), basically disagree (D), or strongly disagree (SD) for each item on the inventory. There was no neutral or undecided choice provided but multiple responses and blank responses were so construed for scoring purposes. If an item were keyed in the SA direction, then it was scored on the basis of 5 points for SA, 4 points for A, 3 points for no response or a multiple response, 2 points for D, and 1 point for SD. When an item was keyed in the SD direction, the points were reversed. The composite score was determined by finding the sum of the scores on the forty-nine items of the first four subscales. Composite scores could range from 49 to 245. A score of 147 was considered neutral. The key for the MTI:TP is given in Appendix A, p. 160.

The seven items of the Mathematical Orientation subscale were not included in the composite score, because neither the utilitarian nor the disciplinarian orientation toward mathematics was considered inappropriate. The items of this subscale were keyed in the utilitartian direction. Scores above 21 suggest a utilitarian point of view.

The MTI:TP could also be scored on a right-wrong basis by giving 1 point for any answer in the direction of the keyed response and no points for blank responses, multiple responses, and responses in the opposite direction of the key. This method of scoring could detect changes in point of view from one side of the scale to the other but would not be sensitive to shifts in the strength of responses if in the same direction. Although some of the MTI:TP data were analyzed by both methods of scoring, all results are reported on the 5-4-3-2-1 point scale unless noted otherwise.

Mathematics Teaching Inventory: Student Perceptions (MTI:SP)

The student form of the above instrument was patterned after a similar instrument developed for science education by Richard L. Sagness (48, 190). The items parallel those of the MTI:TP. This inventory provides information concerning students' perceptions of the secondary mathematics teacher's use of strategies and activities. The MTI:SP has the same subscales as the teacher form except that there is no subscale for Mathematical Orientation. Appendix B contains the instrument (p. 162) and identifies the items contained in each subscale (p. 166).

Each statement of the inventory describes some classroom activity or situation to which the students were asked to indicate true or false depending on what they think happened in their classroom. The answers were recorded on digitek (machine-scored) answer sheets. The composite and subscale scores were obtained by scoring 1 point for each response agreeing with the keyed response and no points for blank responses or responses disagreeing with the key. The key for the Mathematics Teaching Inventory: Student Perceptions is contained in Appendix B, p.167 .

This inventory was submitted to four members of the Faculty of Science and Mathematics Education for authoritative validation. They were asked to respond to the instrument as they thought students should respond, if the teacher were using appropriate activities and strategies. Their responses and those of this researcher were in agreement for forty of the forty-six items. The six items for which there was no substantial agreement were not keyed or scored but were retained for descriptive, anecdotal data.

Reliability estimates for the Mathematics Teaching Inventory: Student Perceptions were computed using the New Item Analysis Program developed by the Office of Evaluation of The Ohio State University. Table 8 lists the KR-20 and KR-21 reliabilities for each sample of the study.

Table 8

KUDER-RICHARDSON 20 AND 21 RELIABILITY

ESTIMATES FOR THE MATHEMATICS TEACHING INVENTORY:

STUDENT PERCEPTIONS

| Sample | Quarter | N | KR-20 Estimate* | KR-21 Estimate* |
|---|---|---|---|---|
| Student Teachers' Pupils | Fall | 406 | .613 | .514 |
| Cooperating Teachers' Pupils | Winter | 963 | .504 | .381 |
| Student Teachers' Pupils | Winter | 847 | .527 | .437 |
| Cooperating Teachers' Pupils | Spring | 2089 | .514 | .409 |
| Student Teachers' Pupils | Spring | 1870 | .547 | .486 |

*Based on the forty keyed items

A further check of the reliability of the student form of the Mathematics Teaching Inventory was undertaken using responses from the students in the fourteen classes of nine student teachers during the fall quarter. Frequency counts and percentages of agreement with the key were determined by class for each of the items. This listing, which is given in Appendix J, p. 222, provided the basis for an informal analysis of the ability of students to make the judgements about their teachers' activities required by the MTI:SP. Student responses having either a high or a low percentage of agreement with the key would suggest that the students generally agreed with each other.

The average size of the classes used for this analysis was 22. The smallest class size of 16 was assumed to be the size of all fourteen classes in order to provide a conservative estimate of agreement. If students were responding to an item of the MTI:SP by chance alone, one would expect that 8 students would agree with a particular item and 8 would not agree in a class of 16 students. Using the binomial distribution for n=16 and p=.5, it was determined that the cumulative probability of having less than 6 (31 per cent) or more than 10 (69 per cent) students in agreement on an item was .21. Using the binomial distribution again (n=14, p=.21), there was a 5 per cent chance or less for 6 or more of the 14 classes to have this amount of agreement with the key on any particular item. Thirty-five of the forty-six items had 6 or more classes meeting the criteria indicated above. Items 5, 10, 12, 14, 26, 27, 34, 37, 40, 41, and 43 failed to meet these criteria. These items may have been stated such that students had difficulty in making the requisite interpretation and judgements, or the teachers may have been inconsistent in using the particular activities.

Cultural Attitude Inventory (CAI) (Appendix C, p. 168)

The Cultural Attitude Inventory was devised by Dorothy J. Shaw (53) at Pennsylvania State University in 1966 and subsequently modified for the Mid-continent Regional Educational Laboratory ( 63). The revised form was used in this study.

The Inventory is purported to measure compatibility to teach in culturally deprived schools. Two subscales are provided: one dealing

with the respondent's attitude toward culturally deprived school children, and the other concerning the respondent's knowledge of culturally deprived school children. The fifty items are scored on a five-point scale allowing a range of scores from 50 (culturally incompatible) to 250 (culturally compatible).

Skeel reports the reliability of the instrument as computed by the Kuder-Richardson formula of internal consistency to be .46 (53, 52) and .63 (53, 74). Howe reported a KR-20 reliability estimate of .68 for the CAI (48, 55).

Teaching Situation Reaction Test (TSRT) (Appendix D, p. 172)

The Teaching Situation Reaction Test is intended to measure a person's views of the kinds of behavior that are appropriate in a variety of classroom teaching circumstances. The situations were designed to be subject matter neutral. The instrument used in this study is the 1966 revision by Duncan and Hough. This forty-eight item test measures the following dimensions: (1) the type of teacher classroom control (indirect versus direct); (2) the classroom relationship the teacher has with students (student centered or teacher centered); (3) the approach the teacher takes to classroom problem solving (objective versus subjective); (4) the approach the teacher has toward classroom methodology (experimental versus conservative). ( 63, 94-95).

A number of studies, summarized by Duncan and Hough (16) have indicated that the TSRT is an instrument of acceptable predictive validity, test-retest reliability (.84 and .84), and fake resistance.

Contemporary Mathematics: A Test for Teachers (Massie) (Appendix E, p. 189)

This forty-eight item test was constructed by Ronald O. Massie to measure a secondary teacher's familiarity with concepts of modern mathematics. Massie reported a KR-20 reliability of .81 and stated that each of the items is valid since a significant positive correlation with the total test score was established. (33, 90)

Checklist For Assessment of Teachers: Supervisor's Perceptions (CFAT:SP) (Appendix F, p. 200)

This checklist, which is designed to evaluate the behavior of student teachers, is a 1970 revision of the Teacher Rating Scale that was developed at Oregon State University. An earlier revision of the Teacher Rating Scale was used between 1963 and 1968 by the science education department of The Ohio State University in evaluating 160 student teachers in the biological sciences. 120 were rated by their students (KR-20 = .85) and 40 were rated by their students (KR-20 = .81). A follow-up study has also been done with 30 teachers in the Oregon schools. KR-20 reliabilities reported from this sample are .84 and .86.

The CFAT:SP is a ten-item instrument scored on a five-point basis. It has two subscales; Subscale A is Teacher-Pupil Relationships and Subscale B is Teacher's Personal Adjustment.

Checklist For Assessment of Teachers: Pupil's Perceptions (CFAT:PP) (Appendix G, p. 206)

This five-item instrument is the student form of the above checklist. It parallels the Teacher-Pupil Relationships subscale of

the CFAT:SP and is scored on a five-point basis.

Pre-Student Teaching Block Questionnaires (Appendix H, p. 209)

Two questionnaires were designed to provide information about the project pre-service teachers' background, their commitment to teaching, their preferences in teaching, their expectations concerning in-school experiences, their views of the importance of mathematics, and their attitude toward and suggestions for the project.

Student Teaching Quarter Questionnaires (Appendix I, p. 215)

The two questionnaires for student teachers were designed to provide data concerning their backgrounds, commitment to teaching, preferences in teaching, views of the importance of mathematics, and reactions to and suggestions for improving the student teaching experience.

The cooperating teacher questionnaire (p. 221) provides information regarding the cooperating teacher's undergraduate and graduate education, teaching experience, previous supervision of student teachers, current teaching assignment, and extra-curricular responsibilities.

## Procedures for Administration of Instruments

The sequence for the administration of the instruments that were used in this study is indicated in Table 9. It lists the various groups involved, the instruments used, and the quarters they were given. For each quarter, pretest instruments were administered

during the first two weeks and posttests instruments were given the last two weeks. These instruments are paper-and-pencil tests and are contained in Appendices A through I. A brief description of the administrative procedures used with each group follows:

Project Teachers

The project teachers were given instruments during both pre-student teaching block ($S_1$) and the student teaching quarter ($S_2$). The Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP), the Cultural Attitude Inventory (CAI), a questionnaire (qtnre), and the Teaching Situation Reaction Test (TSRT) were administered as both pretests and posttests during the $S_1$ quarter and as posttests during the $S_2$ quarter.

Table 9

SEQUENCE OF INSTRUMENT ADMINISTRATION

| | University Quarters | | | | | |
|---|---|---|---|---|---|---|
| | Autumn 1970 | | Winter 1971 | | Spring 1971 | |
| | Pre | Post | Pre | Post | Pre | Post |
| Project Teachers | $S_1^1$<br>MTI:TP*<br>CAI<br>Qtnre<br>TSRT | MTI:TP<br>CAI<br>Qtnre<br>TSRT<br>Massie | $S_2^1$ | MTI:TP<br>CAI<br>Qtnre<br>TSRT | | |
| | | | $S_1^2$<br>MTI:TP<br>CAI<br>Qtnre<br>TSRT | MTI:TP<br>CAI<br>Qtnre<br>TSRT<br>Massie | $S_2^2(\&S_2^1)$<br>MTI:TP<br>CAI<br>Qtnre<br>TSRT | |
| Non-Project Teachers | $N^1$<br>MTI:TP<br>CAI<br>Qtnre<br>TSRT<br>Massie | MTI:TP<br>CAI<br>Qtnre<br>TSRT | $N^2$<br>MTI:TP<br>CAI<br>Qtnre<br>TSRT<br>Massie | MTI:TP<br>CAI<br>Qtnre<br>TSRT | $N^3$<br>MTI:TP<br>CAI<br>Qtnre<br>TSRT<br>Massie | MTI:TP<br>CAI<br>Qtnre<br>TSRT |
| Cooperating Teachers | $N^1$<br>--- | MTI:TP<br>Qtnre | $N^2$ & $S_2^1$<br>MTI:TP | MTI:TP<br>Qtnre | $N^3$ & $S_2^2(\&S_2^1)$<br>MTI:TP | MTI:TP<br>Qtnre |
| Classroom Students | $N^1$<br>--- | MTI:SP<br>(ST)<br>CFAT:PP | $N^2$ & $S_2^1$<br>MTI:SP<br>(CT) | MTI:SP<br>(ST)<br>CFAT:PP | $N^3$ & $S_2^2(\&S_2^1)$<br>MTI:SP<br>(CT) | MTI:SP<br>(ST)<br>CFAT:PP |
| College Supervisors | $N^1$ | CFAT:SP | | $N^2$ & $S_2^1$<br>CFAT:SP | $N^3$ & $S_2^2(\&S_2^1)$ | CFAT:SP |

*Key to Abbreviations

MTI:TP - Mathematics Teaching Inventory: Teacher Perceptions
MTI:SP - Mathematics Teaching Inventory: Student Perceptions

Table 9 (con't)

CAI - Cultural Attitude Inventory
Qtnre - Questionnaire
TSRT - Teaching Situation Reaction Test
Massie - Contemporary Mathematics: A Test For Teachers
CFAT:PP- Checklist For Assessment of Teachers: Pupil's Perceptions
CFAT:SP- Checklist For Assessment of Teachers: Supervisor's Perceptions
CT - Cooperating Teacher
ST - Student Teacher
$S_j^i$ - the jth project quarter of the ith project group; i,j = 1,2
$N^k$ - the kth non-project group; k = 1,2,3

These instruments were given in a group setting and in the order indicated. The $S_1$ posttest scores were also used as the $S_2$ pretest scores since there was only a two-week period between quarters for most of these students. In addition, Massie's Contemporary Mathematics: A Test For Teachers was administered following the other posttests in order to approximate the stage at which the non-project teachers were taking this test.

Non-Project Teachers

The non-project teachers (designated in Table 9 by $N^1$, $N^2$, or $N^3$ depending on enrollment for student teaching Autumn 1970, Winter 1971, or Spring 1971 respectively) also took the MTI:TP, the CAI, a questionnaire, and the TSRT on both a pretest and a posttest basis during the quarter in which they were enrolled for student teaching. Massie's test was given only once following the other pretests. Data were not collected from the non-project teachers during the quarter(s) preceding student teaching.

Cooperating Teachers

The cooperating teachers of both the project and non-project student teachers were requested to take the Mathematics Teaching Inventory: Teacher Perceptions near the beginning and end of the student teaching quarter. An exception to this, which is indicated in Table 9, occurred during the Autumn quarter. Only posttest materials were administered to these cooperating teachers (and their students). Each cooperating teacher also completed a questionnaire.

Classroom Students

The classroom students in each class for which the student teacher had a major teaching responsibility were asked to take the Mathematics Teaching Inventory: Student Perceptions near the beginning of the student teaching quarter and again near the end of the same quarter. The first administration was conducted and supervised by the cooperating teacher and directed at the activities and strategies which he used in teaching the classes; the second applied to the activities and strategies used by the student teacher, who conducted and supervised this administration of the MTI:SP. The same classes also rated the student teachers near the end of the student teaching experience using the Checklist For Assessment of Teachers: Pupils Perceptions. (Appendix G, p. 206 )

College Supervisors

An additional rating of the student teacher was obtained from the college supervisors who completed the Checklist For Assessment

of Teachers: Supervisor's Perceptions (Appendix F, p. 200) for each student teacher under their supervision.

## Statistical Programs Used for Analysis

Several computer programs were used to test hypotheses and summarize data. A BMD-03D Correlation With Item Deletion Program developed by the Health Sciences Computing Facilities at UCLA (15) was used to obtain means, standard deviations, and correlations for the variables of the study. T-ratios for within group and between group differences were computed using programs developed by White and Shumway: the WAS7 program is designed to compute the correlated t-ratio for the difference between means of two dependent samples and was used to analyze within group differences on pretest-posttest data; the WAS5 program is designed to compute the t-ratio for the differences between means of two independent samples and was used in the analysis of differences between the project and non-project groups.

## CHAPTER IV

## ANALYSIS OF DATA

A discussion of the data relating to the hypotheses is presented in this chapter. The first section is an analysis of the patterns of change exhibited by project and non-project teachers. The second section is an investigation of the correlational relationships between the pre-service teacher variables and the criterion variables.

### Patterns of Change

#### Pre-Student Teaching Block

The first five hypotheses were tested to investigate patterns of change for project pre-service teachers during the pre-student teaching block. Table 10, p.70, presents a summary of the t-values obtained for this analysis.

Hypothesis 1: At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed their perceptions about what should occur in the teaching of secondary school mathematics as measured by the MTI:TP composite score.

The correlated t-values for differences between means of the pretest and posttest MTI:TP measures were computed using the scores obtained by both the five-point basis and the right-wrong basis. Using the five-point scoring basis, the t-value was 5.57 on the MTI:TP composite scores of the total $S_1$ project group. Based on the right-wrong scoring, the t-value was 6.12. Each of these values was significant at the .001 level as shown in Table 10. This hypothesis was rejected. The change was in the direction of higher composite scores and was primarily due to the influence of the Strategies of Teaching Mathematics subscale. The scores on this subscale yielded even higher t-ratios which were also significant at the .001 level. In addition, the Perceptions of Teacher-Pupil Roles subscale had a significant t-value under each scoring method, but the t-value for the Use of Textbook subscale was significant only under the first method of scoring. None of the t-values for the Design and Use of Tests or the Mathematical Orientation subscales approached significance. Table 10 provides additional t-values for the individual $S_1$ quarters. The t-values and significance levels generally suggest greater change during the winter $S_1$ quarter.

Hypothesis 2: At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed in their compatibility to work in culturally deprived schools as measured by the CAI composite score.

Table 10 indicates that the t-value for testing this hypothesis was 1.63. This was not significant at the .05 level. This hypothesis

Table 10

Correlated t-Values for Comparison of

$S_1$ Project Teachers' Pretest and Posttest Scores

| MTI:TP (5 pt. basis) | Fall $S_1$ t | sig. level | N | Winter $S_1$ t | sig. level | N | Total $S_1$ t | sig. level | N |
|---|---|---|---|---|---|---|---|---|---|
| Composite | 2.32 | .05 | 22 | 5.51 | .001 | 30 | 5.57 | .001 | 52 |
| Teacher-Pupil Roles | 1.90 | NS* | 22 | 2.29 | .05 | 30 | 2.99 | .01 | 52 |
| Use of Textbook | .26 | NS | 22 | 2.62 | .02 | 30 | 2.29 | .05 | 52 |
| Design and Use of Tests | .21 | NS | 22 | -.14 | NS | 30 | .05 | NS | 52 |
| Strategies of Teaching Math | 2.15 | .05 | 22 | 7.08 | .001 | 30 | 6.15 | .001 | 52 |
| Mathematical Orientation | -1.45 | NS | 22 | .30 | NS | 30 | -.94 | NS | 52 |
| MTI:TP (right-wrong basis) | | | | | | | | | |
| Composite | 3.02 | .01 | 22 | 5.56 | .001 | 30 | 6.12 | .001 | 52 |
| Teacher-Pupil Roles | 2.98 | .01 | 22 | 2.36 | .05 | 30 | 3.74 | .001 | 52 |
| Use of Textbook | -.22 | NS | 22 | 1.51 | NS | 30 | 1.17 | NS | 52 |
| Design and Use of Tests | .35 | NS | 22 | -1.06 | NS | 30 | -.50 | NS | 52 |
| Strategies of Teaching Math | 2.58 | .02 | 22 | 7.19 | .001 | 30 | 6.50 | .001 | 52 |
| Mathematical Orientation | -1.39 | NS | 22 | .07 | NS | 30 | -.95 | NS | 52 |
| CAI | | | | | | | | | |
| Composite | -.14 | NS | 22 | 2.56 | .02 | 30 | 1.63 | NS | 52 |
| Attitude | .30 | NS | 22 | 1.50 | NS | 30 | 1.24 | NS | 52 |
| Knowledge | -.63 | NS | 22 | 2.92 | .01 | 30 | 1.39 | NS | 52 |

| Table 10 (con't) | t | level | N | t | level | N | t | level | N |
|---|---|---|---|---|---|---|---|---|---|
| TSRT | -.53 | NS | 22 | 1.57 | NS | 30 | .76 | NS | 52 |

*NS = Not Significant

was not rejected. Further analysis of the individual $S_1$ project groups by quarter, however, suggested quite different patterns of change on the CAI for these two groups. The fall $S_1$ project group's t-value of -.14 was in the direction of lower posttest scores but not significant. The t-value of 2.56 on the CAI composite scores of the winter $S_1$ project group was significant at the .02 level in the direction of higher posttest scores.

Hypothesis 3: At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed their attitudes toward culturally deprived students as measured by the CAI attitude subscale.

The t-values determined in testing this hypothesis were 1.24, .30, and 1.50 for the total, fall, and winter project groups, respectively. None of these was significant at the .05 level. This hypothesis was not rejected.

Hypothesis 4: At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed in their knowledge of culturally deprived students as measured by the CAI knowledge subscale.

Table 10, p.70, shows the t-value for testing this hypothesis was 1.39. This was not significant at the .05 level. This hypothesis

was not rejected. Subsequent analyses by quarter revealed that the t-value was in the negative direction but not significant for the fall $S_1$ teachers and significant at the .01 level in the positive direction for the winter project teachers.

Hypothesis 5: At the completion of the $S_1$ quarter, the project pre-service teachers will not have significantly changed their reactions to teaching situations as measured by the TSRT.

The t-value of .76 for this hypothesis was not significant at the .05 level, nor were the t-values (-.53 and 1.57) for the individual fall and winter $S_1$ groups significant. This hypothesis was not rejected.

A summary of the means and standard deviations on the pre- and posttest scores of the MTI:TP, CAI and TSRT for the individual and total $S_1$ project populations is presented in Table 11.

Project Student Teachers

The next five hypotheses were tested to investigate the patterns of change for the project teachers during the student teaching quarter. Table 12, p.75, presents a summary of the t-values obtained for this analysis.

Hypothesis 6: At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their perceptions of what should occur in the teaching of secondary mathematics as measured by the MTI:TP.

Table 11

Means and Standard Deviations

on the MTI, CAI, and TSRT for the

Autumn, Winter, and Total $S_1$ Project Groups

| | Autumn $S_1$ | | | | Winter $S_1$ | | | | Total $S_1$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MTI:TP (5 pt. basis) | Pretest Mean | S.D. | Posttest Mean | S.D. | Pretest Mean | S.D. | Posttest Mean | S.D. | Pretest Mean | S.D. | Posttest Mean | S.D. |
| Composite | 183.5 | 12.5 | 188.3 | 12.4 | 179.7 | 12.3 | 189.8 | 8.9 | 181.3 | 12.4 | 189.2 | 10.5 |
| Teacher-Pupil Roles | 32.3 | 3.7 | 33.5 | 3.1 | 31.4 | 3.6 | 32.6 | 2.9 | 31.8 | 3.6 | 33.0 | 3.0 |
| Use of Textbook | 34.5 | 2.3 | 34.6 | 3.0 | 33.3 | 2.7 | 34.8 | 2.7 | 33.8 | 2.6 | 34.7 | 2.8 |
| Design and Use of Tests | 31.2 | 3.6 | 31.4 | 3.8 | 31.6 | 2.7 | 31.6 | 2.8 | 31.5 | 3.1 | 31.5 | 3.2 |
| Strategies of Teaching Math | 85.5 | 7.5 | 88.8 | 7.8 | 83.4 | 7.1 | 90.9 | 5.5 | 84.3 | 7.3 | 90.0 | 6.6 |
| Mathematical Orientation | 20.8 | 3.4 | 18.8 | 4.1 | 20.0 | 2.8 | 20.2 | 2.8 | 20.0 | 3.1 | 19.5 | 3.5 |
| MTI:TP (right-wrong basis) | | | | | | | | | | | | |
| Composite | 36.9 | 3.4 | 39.1 | 4.1 | 36.7 | 4.5 | 40.1 | 3.4 | 36.8 | 4.0 | 39.7 | 3.7 |
| Teacher-Pupil Roles | 6.5 | 1.3 | 7.1 | 1.0 | 6.5 | 1.3 | 7.0 | 1.1 | 6.5 | 1.3 | 7.0 | 1.1 |
| Use of Textbook | 7.1 | .9 | 7.0 | 1.0 | 7.0 | 1.2 | 7.4 | 1.0 | 7.0 | 1.1 | 7.2 | 1.0 |
| Design and Use of Tests | 6.6 | 1.0 | 6.7 | 1.4 | 6.9 | 1.0 | 6.7 | 1.0 | 6.8 | 1.0 | 6.7 | 1.2 |
| Strategies of Teaching Math | 16.7 | 2.4 | 18.3 | 2.9 | 16.3 | 2.5 | 19.1 | 2.2 | 16.5 | 2.4 | 18.7 | 2.5 |
| Mathematical Orientation* | 20.6 | 2.6 | 19.6 | 2.9 | 20.4 | 2.3 | 20.4 | 2.1 | 20.5 | 2.4 | 20.1 | 2.5 |
| CAI | | | | | | | | | | | | |
| Composite | 191.7 | 9.9 | 191.4 | 10.2 | 188.9 | 12.3 | 192.4 | 10.7 | 190.1 | 11.3 | 192.0 | 10.4 |
| Attitude | 108.3 | 7.7 | 108.7 | 6.6 | 106.3 | 8.1 | 107.8 | 7.4 | 107.1 | 7.9 | 108.2 | 7.0 |
| Knowledge | 71.2 | 5.8 | 70.6 | 5.9 | 71.0 | 5.3 | 72.9 | 4.4 | 71.1 | 5.5 | 71.9 | 5.2 |
| TSRT | 207.4 | 12.1 | 205.8 | 15.3 | 210.9 | 15.3 | 214.4 | 11.5 | 209.4 | 14.0 | 210.8 | 13.8 |

*Based on 4 points for a utilitarian response and 2 points for a disciplinarian response. A score of 21 on this subscale is neutral using either scoring method.

The correlated t-value obtained in testing this hypothesis was -2.43. This was significant at the .02 level. This hypothesis was rejected. The change was in the direction of lower composite scores. The t-value for the Perceptions of Teacher-Pupil Roles subscale was also significant at the .02 level in the direction of lower posttest scores.

Hypothesis 7: At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their compatibility to work in culturally deprived schools as measured by the CAI composite score.

The t-value of -3.98 indicated significance at the .001 level and generally lower posttest scores. This hypothesis was rejected.

Hypothesis 8: At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their attitudes toward culturally deprived students as measured by the CAI attitude subscale.

The t-value determined in testing this hypothesis was -3.72. This was significant at the .001 level and indicated generally lower posttest scores. This hypothesis was rejected.

Hypothesis 9: At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their knowledge of culturally deprived students as measured by the CAI knowledge subscale.

Table 12

Correlated t-Values for Comparison of

Student Teachers' Pretest and Posttest Scores

| | Project (N=48) | | Non-Project (N=23) | | Total (N=71) | |
|---|---|---|---|---|---|---|
| MTI:TP | t | sig. level | t | sig. level | t | sig. level |
| Composite | -2.43 | .02 | -.47 | NS | -2.27 | .05 |
| Teacher-Pupil Roles | -2.44 | .02 | .82 | NS | -1.66 | NS |
| Use of Textbook | -1.71 | NS* | -1.22 | NS | -2.11 | .05 |
| Design and Use of Tests | -1.94 | NS | -.92 | NS | -2.12 | .05 |
| Strategies of Teaching Math | -1.25 | NS | .09 | NS | -.91 | NS |
| Mathematical Orientation | .09 | NS | .62 | NS | .43 | NS |
| CAI | | | | | | |
| Composite | -3.98 | .001 | -2.77 | .02 | -4.88 | .001 |
| Attitude | -3.72 | .001 | -3.68 | .01 | -5.16 | .001 |
| Knowledge | -1.87 | NS | -.78 | NS | -2.01 | .05 |
| TSRT | -4.62 | .001 | -2.01 | NS | -4.97 | .001 |

*NS = Not Significant

The t-value obtained in testing this hypothesis was negative and suggested generally lower posttest scores. However, this t-value (-1.87) was not significant at the .05 level; this hypothesis could not be rejected.

Hypothesis 10: At the completion of the student teaching quarter, the project pre-service teachers will not have significantly changed their reactions to teaching situations as measured by the TSRT.

The t-value of -4.62 for this hypothesis was significant at the .001 level. This t-value reinforces the pattern of generally lower posttest scores for project student teachers. This hypothesis was rejected.

Non-Project Student Teachers

The last five hypothesis of this section were tested to investigate the patterns of change for the non-project student teachers.

Hypothesis 11: At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP.

Table 12, p.75, indicates that the t-value for testing this hypothesis was -.47. This was not significant at the .05 confidence level. This hypothesis was not rejected.

Hypothesis 12: At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their compatibility to work in culturally deprived schools as measured by the CAI composite score.

The t-value for this hypothesis of -2.77 was significant at the .02 level. This suggested change in the direction of lower posttest scores for the non-project student teachers. This hypothesis was rejected.

Hypothesis 13: At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their attitudes toward culturally deprived students as measured by the CAI attitude sub-scale.

The t-value of -3.68 was the largest (in absolute value) of those obtained from the non-project scores. It was significant at the .01 level and again suggested lower posttest scores. This hypothesis was rejected.

Hypothesis 14: At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their knowledge of culturally deprived students as measured by the CAI knowledge sub-scale.

Table 12, p.75, indicates that the t-value for testing this hypothesis was -.78. This was not significant at the .05 level. This hypothesis was not rejected.

Hypothesis 15: At the completion of the student teaching quarter, the non-project pre-service teachers will not have significantly changed their reactions to teaching situations as measured by the TSRT.

The t-value of -2.01 determined in testing this hypothesis did not meet the .05 level of statistical significance. This hypothesis was not rejected.

Further evidence of the trend of posttest scores being significantly lower than pretest scores during the student teaching quarter is given in Table 12, p.75. When considered as a unit, the total group of seventy-one student teachers showed significant losses on each of the five criterion variables which provided foci for this study. The levels of significance attained indicate the greatest losses were for the CAI attitude and TSRT measures. Analysis of the cooperating teachers scores on the MTI:TP did not reveal significant levels of change on the composite measure or the subscales during the student teaching quarter. The correlated t-value of -1.19 (n=62) for the composite scores, however, suggests that the cooperating teachers also had somewhat lower posttest scores on the MTI:TP.

Did student teaching undo the growth exhibited by project teachers during the $S_1$ quarter? The project pre-service teachers generally had higher scores at the completion of the $S_1$ quarter than at the completion of student teaching ($S_2$ quarter). Consequently, an investigation was warranted for this two-quarter period. Correlated t-values were obtained for each of the criterion variables. Table 13 demonstrates that from the beginning of the pre-service teaching block to the end of the student teaching quarter, the project teachers' MTI:TP composite scores significantly increased. The higher composite scores

Table 13

Correlated t-Values for the

Comparison of Project Teachers' $S_1$ Pretest

and $S_2$ Posttest Scores

| MTI:TP | t | sig. level | CAI | t | sig. level |
|---|---|---|---|---|---|
| Composite | 2.11 | .05 | Composite | -2.14 | .05 |
| Teacher-Pupil Roles | .08 | NS | Attitude | -1.91 | NS |
| Use of Textbook | .08 | NS | Knowledge | -.69 | NS |
| Design and Use of Tests | -1.56 | NS | TSRT | -3.94 | .001 |
| Strategies of Teaching Math | 4.29 | .001 | | | |
| Mathematical Orientation | -.96 | NS | | | |

were attributable to the large gains on the Strategies of Teaching Mathematics subscale. However, the significant t-values of -2.14 and -3.94 for the CAI composite and TSRT measures, respectively, indicated that the project teachers' compatibility to teach in culturally deprived schools and their reactions to teaching situations were significantly less positive at the end of student teaching than when they began the project.

## Correlations

The last part of this chapter presents a discussion of the data relating to the thirteen hypotheses used to investigate correlations.

The first six hypotheses were tested to explore the relationships of the project teacher variables with the $S_1$ criterion variables. Appendix M, p. 232, lists the variables used for these analyses. A correlation matrix of the criterion variables with the pre-student teaching block variables is given in Appendix L, p.228 .

$S_1$ Quarter

Hypothesis 1: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP.

Table 14 indicates that the composite MTI:TP pretest scores correlated significantly with the project teachers' pretest compatability to teach in culturally deprived schools, pretest attitudes toward culturally deprived students, and pretest reactions to teaching situations. There was a positive correlation between the composite MTI:TP pretest scores and the project teachers' pretest preferences of the type of student to be taught. Other correlations in Table 14 show the interrelationships of the MTI:TP composite pretest with the subscale pretests and with the posttest composite and subscales. The composite pretest correlated significantly with all of these MTI:TP measures except the Mathematical Orientation subscale pretest ($r_{\cdot}$-0.256) and the Design and Use of Tests subscale posttest ($r_{\cdot}$0.046). The negative correlation given in Table 14 between the composite pretest scores and the Mathematical Orientation posttest

scores provided a weak indication that the pretest scores tended to correlate with utilitarian Mathematical Orientation posttest scores.

Table 14

Pre-Student Teaching Quarter Variables

Correlating Significantly With the

Composite MTI:TP Pretest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [a]*16. | 0.399 | *28. | 0.424 | *35. | 0.510 | *39. | 0.467 | *42. | 0.550 |
| *18. | 0.407 | *33. | 0.664 | *36. | 0.896 | *40. | 0.446 | 43. | -0.281 |
| *22. | 0.359 | *34. | 0.726 | *38. | 0.614 | | | | |

[a]Appendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level.

However, the posttest MTI:TP composite scores did not correlate significantly with the Mathematical Orientation subscales (pretest $r_{=}$-0.047 and posttest $r_{=}$-0.237). This is not surprising since this subscale does not contribute to the composite score.

As shown in Table 15, the posttest MTI:TP score did have significant positive correlations with several project teacher variables including all of the MTI:TP measures (except the Mathematical Orientation subscales), the reactions to teaching situations scores (pre and post), and all of the Cultural Attitude Inventory measures except the pretest knowledge subscale score. There was a significant positive correlation between the grades received during the pre-student teaching quarter and the posttest MTI:TP composite scores. The positive

Table 15

Pre-Student Teaching Quarter Variables Correlating Significantly With the Composite MTI:TP Posttest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [a] 14. | 0.304 | *19. | 0.488 | *32. | 0.614 | *35. | 0.485 | *40. | 0.697 |
| *16. | 0.471 | 21. | 0.286 | *33. | 0.558 | *36. | 0.443 | *41. | 0.362 |
| *17. | 0.508 | *22. | 0.396 | 34. | 0.330 | *39. | 0.675 | *42. | 0.807 |
| *18. | 0.451 | *23. | 0.558 | | | | | | |

[a]Appendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level.

correlation (r=0.272) between the composite posttest scores and being married was almost significant (r=0.273, N=52) at the .05 level.

Hypothesis 2: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' compatibility to work in culturally deprived schools as measured by the Cultural Attitude Inventory composite score.

In addition to intercorrelating significantly with each of the listed Cultural Attitude Inventory measures, the pretest and posttest CAI composite scores showed significant positive correlations with several MTI:TP measures including the posttest MTI:TP composite score. Tables 16 and 17 list these and other significant correlations with the composite CAI pretest scores and the composite CAI posttest scores, respectively.

Table 16

Pre-Student Teaching Quarter Variables
Correlating Significantly With the Composite
Cultural Attitude Inventory Pretest Score

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| * 3. | 0.382 | *19. | 0.689 | *26. | -0.483 | *36. | 0.358 | *39. | 0.382 |
| *11. | 0.389 | *20. | 0.717 | *32. | 0.399 | *37. | -0.408 | 40. | 0.317 |
| *17. | 0.701 | *21. | 0.395 | 35. | 0.318 | *38. | 0.471 | *42. | 0.362 |
| *18. | 0.867 | | | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Both CAI composite scores also had a significant correlation with the pretest kind-of-school preferences. The negative correlation suggests that those project pre-service teachers having urban school pretest preferences tended to score higher on both the CAI pretest and posttest.

Table 17

Pre-Student Teacher Quarter Variables Correlating
Significantly With the
Composite CAI Posttest Score

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 10. | 0.296 | *19. | 0.862 | *21. | 0.717 | 35. | 0.341 | *41. | 0.394 |
| *16. | 0.701 | *20. | 0.655 | *26. | -0.440 | *38. | 0.508 | *42. | 0.404 |
| *18. | 0.510 | | | | | | | | |

*Indicates .01 sig. level; other are .05 sig. level.

The pretest CAI composite scores showed significantly positive correlations (.01 level) with the project teachers' age and grade point average (upon entering education). The posttest composite CAI correlation with age ($r = 0.140$) was also positive but not significant.[1] However, the posttest composite CAI score did have a significant positive correlation with commitment to teaching indicating those project teachers having higher scores on the CAI posttest tend to have a greater commitment to teaching at the end of the pre-student teaching block than when they began this experience.

Hypothesis 3: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' attitudes toward culturally deprived students as measured by the CAI attitude subscale.

The project teachers' pretest CAI attitude scores had significant correlations with seventeen of the pre-student teaching quarter variables as shown in Table 18.

There was significant positive intercorrelation with each of the CAI measures except the posttest knowledge subscale. Both the pretest and posttest MTI:TP composite scores and several of their subscale scores had a significant positive correlation with the pretest CAI attitude scores. The negative correlation with variable 37 suggests

[1] The correlations with age are in the opposite direction of Sagness' findings indicating a negative relationship between age and the CAI composite scores. His negative correlation of age with the CAI posttest composite scores was significant at the .05 level. (48, 74)

Table 18

Pre-Student Teaching Quarter Variables Correlating Significantly With the Pretest CAI Attitude Subscale Score

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| [a]* | 3. | 0.460 | *19. | 0.667 | *27. | -0.412 | *36. | 0.387 | *39. | 0.419 |
| | *11. | 0.396 | 20. | 0.288 | *32. | 0.407 | 37. | -0.318 | 40. | 0.327 |
| | *16. | 0.867 | 23. | 0.333 | 33. | 0.329 | *38. | 0.451 | *42. | 0.413 |
| | *17. | 0.510 | *26. | -0.600 | | | | | | |

[a]Appendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level.

that those project pre-service teachers having more positive pretest attitudes toward culturally deprived students tended to have a disciplinarian pretest orientation toward mathematics. Other variables that showed a significant positive correlation with the pretest CAI attitude subscale were the project teachers' TSRT posttest scores, age, and grade point average upon entering education. There was also a significant correlation between the pretest CAI attitude scores and the project teachers' pre and post preferences of kind-of-school in the direction of urban schools.

The posttest CAI attitude scores were significantly correlated with each of the pre and post CAI measures but with only the posttest MTI:TP measures as indicated in Table 19. The only other project pre-service teacher variables that had a significant correlation with the posttest CAI attitude subscale were the TSRT pretest and the pre

and post preferences of type of school (again in the direction of urban schools).

Table 19

Pre-Student Teaching Quarter Variables

Correlating Significantly With

The Posttest CAI Attitude Subscale

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *16. | 0.687 | *20. | 0.419 | *26. | -0.539 | *38. | 0.488 | 40. | 0.320 |
| *17. | 0.862 | 21. | 0.282 | *27. | -0.442 | 39. | 0.328 | *42. | 0.385 |
| *18. | 0.667 | 22. | 0.296 | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Hypothesis 4: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' knowledge of culturally deprived students as measured by the CAI knowledge subscale.

The pre-student teaching quarter variables which significantly correlated with the pretest CAI knowledge subscale are listed in Table 20. The pretest knowledge scores intercorrelated significantly with all of the CAI measures. Both the pre and post scores on the MTI:TP Design and Use of Tests subscale had a positive correlation with the pretest CAI knowledge subscale at the .01 level. There was a significant negative correlation between the pretest MTI:TP Mathematical Orientation subscale and the pretest CAI knowledge scores. This

Table 20

Pre-Student Teaching Quarter Variables
Correlating Significantly With the
Pretest CAI Knowledge Subscale

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [a] 6. | -0.384 | *16. | 0.717 | 18. | 0.288 | *21. | 0.689 | 37. | -0.326 |
| 10. | 0.273 | *17. | 0.655 | *19. | 0.419 | *35. | 0.364 | *41. | 0.393 |

[a]Appendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level

indicated that project students having a disciplinarian orientation toward mathematics tended to have higher CAI knowledge scores. The pretest CAI knowledge subscale scores had a significant positive correlation with commitment to teaching but a negative significant correlation with the ACT mathematics percentile scores.

Table 21 indicates that the only variables that had a significant correlation with the posttest CAI knowledge subscale responses

Table 21

Pre-Student Teaching Quarter Variables
Correlating Significantly With the
Posttest CAI Knowledge Subscale

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *16. | 0.395 | 19. | 0.282 | 35. | 0.319 | 38. | 0.286 | 41. | 0.481 |
| *17. | 0.717 | *20. | 0.689 | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

were the CAI and MTI:TP measures. Each of the CAI scores except the pretest attitude subscale correlated significantly with the posttest knowledge score. Only three MTI:TP measures, the posttest composite scores and the pre and post Design and Use of Tests subscale, showed a significant correlation with the project teachers' posttest knowledge of culturally deprived students.

Hypothesis 5: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' reactions to teaching situations as measured by the Teaching Situation Reaction Test.

Table 22 shows that there were no significant correlations of the Teaching Situation Reaction Test pretest with the other project

Table 22

Pre-Student Teaching Quarter Variables

Correlating Significantly With

the TSRT Pretest

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| a*23. | 0.559 | *33. | 0.408 | *38. | 0.396 | 39. | 0.279 | *42. | 0.449 |
| *32. | 0.359 | 36. | 0.349 | | | | | | |

aAppendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig level; others are .05 sig. level.

pre-service teacher variables except with the TSRT posttest and the MTI:TP. The TSRT pretest correlations with the MTI:TP composite

scores, Perceptions of Teacher-Pupil Roles subscale, and the Strategies of Teaching Mathematics subscale were significant for both the pretest and the posttest.

The TSRT posttest had a greater number of significant correlations with the project pre-service teacher variables as indicated in Table 23. Five variables having a significant positive correlation with the TSRT posttest were found at the .05 level. These are

Table 23

Pre-Student Teaching Quarter Variables

Correlating Significantly With

the TSRT Posttest

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 0.311 | 18. | 0.333 | *30. | 0.401 | *38. | 0.558 | *40. | 0.373 |
| 4. | 0.395 | 19. | 0.296 | *33. | 0.421 | *39. | 0.381 | *42. | 0.527 |
| 7. | 0.462 | *22. | 0.559 | | | | | | |

*Indicates .01 sig. level; others are .05.

the pre and post CAI attitude subscale scores, the ACT social studies and composite percentiles, and the quarter enrolled in the project. At the .01 level there were significant positive correlations with the MTI:TP measures (primarily the posttest scores), the TSRT pre test, and marital status. The correlation with the latter variable is in the direction of married students tending to have higher TSRT posttest scores.

Hypothesis 6: There are no significant correlations between the measures of the project pre-service teacher variables and the project pre-service teachers' participation in the Junior Project.

The project pre-service teacher variables that showed a significant correlation with Junior Project participation are listed in Table 24. The positive correlations with Massie's test and the MTI:TP Mathematical Orientation subscale indicate that those pre-service

Table 24

Pre-Student Teaching Quarter Variables

Correlating Significantly With

Junior Project Participation

| | | | | | |
|---|---|---|---|---|---|
| [a] | *1. | 0.389 | 9. 0.336 | 43. | 0.323 |

[a]Appendix M, p.232 provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level.

teachers participating in the Junior Project tended to have higher scores on this test of their knowledge of modern mathematics and to have a utilitarian orientation toward mathematics.

A further analysis of the Junior Project Participation variable by quarter revealed no significant correlations with the project teacher variables for the winter group. However, the pretest ($r=0.642$, $N=13$, sig. $=.05$) and posttest ($r=0.567$, $N=20$, sig. $=.01$) kind-of-school preferences were significant for the fall project group

suggesting that these project teachers who had participated in the Junior Project tended not to choose urban schools for future teaching activity.

The first five of the preceding six correlational hypotheses for the pre-student teaching block were rejected at the 5% level of statistical significance. The sixth hypothesis was not rejected.

Student Teaching Quarter

The last seven correlational hypotheses were tested to explore the relationships of the student teaching variables with the criterion variables. Appendix O, p.245 , lists the variables used for these analyses. A correlation matrix of the criterion and other selected variables with the student teaching variables is given in Appendix N, p. 233.

Hypothesis 1: There are no significant correlations between the measures of the student teaching variables and the student teachers' strategies and activities used in the classroom during student teaching as measured by the MTI:SP composite score.

Table 25 indicates that the student teachers' composite scores on the MTI:SP had significant correlations with seventeen of the student teaching variables. There was a significant positive correlation between the MTI:SP composite scores and each of the ACT percentiles except for the English percentiles. The CFAT:SP composite scores, the CFAT:SP Teacher-Pupil Relationships scores, and the CFAT:PP scores each correlated significantly with the student

teachers' strategies and activities used in the classroom. Other student teacher measures having a significant, positive correlation with the MTI:SP composite scores were the student teachers' grade point averages (before entering education), their pretest type-of-student preferences, and their subscale scores on the MTI:SP.

Table 25

Student Teaching Quarter Variables Correlating Significantly With the Student Teachers' Composite MTI:SP Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [a] 5. | 0.294 | 11. | 0.264 | 33. | 0.288 | *52. | 0.566 | 55. | 0.288 |
| 7. | 0.360 | *12. | 0.320 | *50. | 0.782 | *53. | 0.657 | *58. | 0.372 |
| 8. | 0.369 | *14. | 0.516 | *51. | 0.733 | *54. | 0.434 | *74. | - .254 |
| *9. | 0.433 | *16. | 0.338 | | | | | | |

[a] Appendix O, p. 245, provides a fold-out listing of variables by number.
*Indicates .01 sig. level; others are .05 sig. level.

Four cooperating teacher variables had a significant correlation with the student teachers' MTI:SP scores. The student teachers' strategies and activities used in the classroom correlated significantly with the cooperating teachers' strategies and activities used in the classroom. The student teachers' MTI:SP composite scores also correlated significantly with the cooperating teachers' scores on the MTI:SP Perceptions of Teacher-Pupil Roles and Strategies of Teaching Mathematics subscales. The negative correlation with the cooperating

teachers' MTI:TP Orientation Subscale scores was significant but not high. This weakly suggested that student teachers who received higher pupil ratings on the MTI:SP had cooperating teachers with a (pretest) disciplinarian point of view toward mathematics.

There were no significant correlations between the student teachers' MTI:SP composite scores and any of the student teachers' or cooperating teachers' MTI:TP composite scores. All of these correlations were in fact quite low as indicated in Appendix N, p. 239.

Hypothesis 2: There are no significant correlations between the measures of the student teaching variables and the student teachers' perceptions of what should occur in the teaching of secondary school mathematics as measured by the MTI:TP composite score.

The student teaching quarter measures which correlated significantly (and positively) with the pretest and the posttest composite scores of the student teachers on the MTI:TP were: the GPA in the pre-student teaching block, the pretest and posttest CAI composite and attitude measures, the TSRT pretest and posttest scores, posttest grade level preferences, and several MTI:TP subscale scores.

The student teachers' composite MTI:TP pretest also correlated significantly with their college supervisor's ratings of their personal adjustment and with five of the cooperating teacher variables (59, 67, 75, 76, 79), as shown in Table 26. Those student teachers with higher pretest MTI:TP scores tended to have cooperating teachers

Table 26

Student Teaching Quarter Variables
Correlating Significantly With the Student
Teachers' Composite MTI:TP Pretest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13. | 0.234 | *24. | 0.399 | *39. | 0.567 | *45. | 0.386 | 67. | 0.257 |
| 19. | 0.296 | *27. | 0.521 | *40. | 0.320 | *46. | 0.376 | 75. | 0.300 |
| *21. | 0.472 | *28. | 0.429 | *41. | 0.846 | *47. | 0.626 | *76. | 0.317 |
| *22. | 0.382 | 30. | 0.260 | *43. | 0.664 | *59. | 0.254 | 79. | 0.278 |
| *23. | 0.462 | *38. | 0.735 | *44. | 0.509 | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

who were female, who had recently studied mathematics, or who had higher posttest scores on the MTI:TP.

Other student teaching measures which correlated significantly with the student teachers' MTI:TP posttest scores included the ACT composite, social studies, and natural science percentiles, the GPA before entering education, and the posttest Mathematical Orientation scores. The latter correlation was negative and suggested that those student teachers having a disciplinarian point of view tended to score higher on the MTI:TP posttest. In addition, the cooperating teachers' composite scores on both the MTI:TP pretest and posttest had significant, positive correlation with the student teachers' composite MTI:TP posttest scores.

Table 27

Student Teaching Quarter Variables Correlating Significantly With the Student Teachers' Composite MTI:TP Posttest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 5. | 0.317 | *22. | 0.618 | *30. | 0.396 | *45. | 0.707 | 71. | 0.263 |
| * 8. | 0.399 | *23. | 0.416 | *37. | 0.664 | *46. | 0.554 | *75. | 0.323 |
| 9. | 0.383 | *24. | 0.627 | *38. | 0.604 | *47. | 0.909 | 76. | 0.288 |
| *16. | 0.356 | *26. | 0.312 | *41. | 0.580 | 48. | -.267 | 77. | 0.242 |
| 19. | 0.337 | *27. | 0.490 | *44. | 0.744 | 69. | 0.250 | 79. | 0.261 |
| *21. | 0.362 | *28. | 0.614 | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Hypothesis 3: There are no significant correlations between the measures of the student teaching variables and the student teachers' compatibility to work in culturally deprived schools as measured by the CAI composite score.

Table 28 illustrates the pretest CAI composite scores correlated significantly with each of the other CAI measures and most of the student teachers' MTI:TP measures. The correlation of -.311 with the posttest Mathematical Orientation subscale scores suggests that student teachers having higher pretest CAI scores tended to have a disciplinarian point of view at the completion of student teaching. The only other measures correlating significantly with the CAI pretest were the cooperating teachers' Perceptions of Teacher-Pupil Roles

subscale scores on the MTI:SP (negative correlation) and the year the cooperating teacher last studied mathematics.

Table 28

Student Teaching Quarter Variables Correlating Significantly With the Student Teachers' Composite CAI Pretest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *22. | 0.611 | *26. | 0.515 | *40. | 0.355 | 44. | 0.268 | *48. | -.311 |
| *23. | 0.848 | *37. | 0.472 | *41. | 0.370 | *46. | 0.441 | 55. | -.255 |
| *24. | 0.500 | 38. | 0.256 | *43. | 0.362 | 47. | 0.251 | *67. | 0.352 |
| *25. | 0.689 | | | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

The posttest CAI composite scores also correlated significantly with the other CAI measures and with nearly all of the student teachers' MTI:TP measures (including a negative correlation with the posttest Mathematical Orientation subscale scores). The student teachers' pretest TSRT scores, posttest TSRT scores, and their commitment to teaching also correlated significantly and positively with the CAI posttest.

Three cooperating teacher variables had significant but not high correlations with the CAI posttest scores. There was a negative correlation with the cooperating teachers' MTI:SP Use of Textbook subscale scores and a positive correlation with their MTI:TP Strategies of Teaching Mathematics posttest scores. The year the

Table 29

Student Teaching Quarter Variables
Correlating Significantly With the Student
Teachers' Composite CAI Posttest Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *15. | 0.384 | *26. | 0.720 | 38. | 0.246 | *44. | 0.427 | *48. | -.310 |
| *21. | 0.611 | 27. | 0.294 | 40. | 0.250 | *45. | 0.397 | 56. | -.286 |
| *23. | 0.570 | *28. | 0.385 | *41. | 0.331 | *45. | 0.397 | 67. | 0.286 |
| *24. | 0.898 | *37. | 0.382 | *43. | 0.618 | *46. | 0.455 | 79. | 0.232 |
| *25. | 0.352 | | | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

cooperating teachers last studied mathematics correlated positively with the CAI composite scores at the .05 level for the posttest.

Hypothesis 4: There are no significant correlations between the measures of the student teaching variables and the student teachers' attitude toward culturally deprived students as measured by the CAI attitude subscale.

The student teachers' pretest CAI attitude scores had significant positive correlations with the TSRT measures, most of the MTI:TP scores (for student teachers), and each of the other CAI measures excluding the knowledge pretest scores. The negative correlations with variables 31 and 48 suggested that student teachers having higher pretest CAI attitude scores tended to prefer urban schools at the beginning of student teaching and tended to have a disciplinarian point of view toward mathematics at the completion of student teaching.

Table 30

Student Teaching Quarter Variables

Correlating Significantly With the Student

Teacher' Pretest CAI Attitude Subscale Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [a]*21. | 0.848 | *27. | 0.304 | *38. | 0.389 | *44. | 0.411 | 48. | -.262 |
| *22. | 0.570 | 28. | 0.298 | 39. | 0.265 | 45. | 0.243 | *67. | -0.376 |
| *24. | 0.627 | *31. | -.326 | *41. | 0.369 | *46. | 0.333 | 76. | 0.243 |
| 26. | 0.255 | *37. | 0.462 | *43. | 0.416 | *47. | 0.315 | | |

[a]Appendix O, p. 245, provides a fold-out listing of variables by number.

*Indicates .01 sig. level; others are .05 sig. level

The cooperating teachers' posttest Perceptions of Teacher-Pupil Roles scores on the MTI:TP and the year they last studied mathematics also correlated significantly with the pretest CAI attitude scores.

Table 31 indicates that the posttest CAI attitude scores correlated significantly with most of the other CAI measures (#21 - 26), both TSRT scores (#27 & 28), and many of the MTI:TP measures (#37 - 48). The student teachers' age, ACT social studies percentile, and commitment to teaching also showed significant positive correlations with the posttest CAI attitude scores, while the student teachers' pretest kind-of-school preferences and their posttest orientation toward mathematics again correlated negatively with the attitude scores. The cooperating teachers' posttest MTI:TP composite and Strategies of Teaching Mathematics scores and the year they last studied mathematics complete the list of student teaching measures

that correlated significantly with the student teachers' posttest CAI attitude scores.

Table 31

Student Teaching Quarter Variables Correlating Significantly With the Student Teachers' Posttest CAI Attitude Subscale Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3. | 0.255 | *23. | 0.627 | *37. | 0.399 | *44. | 0.474 | 48. | -.287 |
| 8. | 0.303 | *26. | 0.357 | *38. | 0.359 | *45. | 0.417 | *67. | 0.330 |
| 15. | 0.282 | *27. | 0.369 | *41. | 0.373 | *46. | 0.304 | 75. | 0.257 |
| *21. | 0.500 | *28. | 0.415 | *43. | 0.627 | *47. | 0.596 | *79. | 0.309 |
| *22. | 0.898 | 31. | -.244 | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Hypothesis 5: There are no significant correlations between the measures of the student teaching variables and the student teachers' knowledge of culturally deprived students as measured by the CAI knowledge subscale.

Table 32 indicates that the pretest CAI knowledge scores correlated significantly with only a few of the MTI:TP and CAI measures and with none of the TSRT measures. The pretest knowledge scores also had significant positive correlations with the student teachers' commitment to teaching and their pretest and posttest type-of-student preferences. The pretest knowledge scores correlated negatively

with the student teachers' ratings on the CFAT:SP Teacher-Pupil Relationships subscale and with their cooperating teachers' scores on the Use of Textbook subscale of the MTI:TP posttest.

Table 32

Student Teaching Quarter Variables Correlating Significantly With the Student Teachers' Pretest CAI Knowledge Subscale Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12. | -.277 | *22. | 0.352 | 33. | 0.340 | *40. | 0.480 | *46. | 0.353 |
| 15. | 0.264 | *26. | 0.635 | 34. | 0.276 | 42. | -.269 | 77. | -.252 |
| *21. | 0.689 | | | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

The twelve student teaching variables that correlated significantly with the student teachers' posttest CAI knowledge scores are indicated in Table 33. The posttest knowledge scores had a significant positive correlation with the student teachers' commitment to teaching, the scores on the other CAI measures, the posttest MTI:TP composite scores, and the pretest and posttest scores on the Design and Use of Tests subscale. The cooperating teachers' scores on two of the MTI:SP subscales correlated negatively with the student teachers' posttest CAI knowledge scores.

Table 33

Student Teaching Quarter Variables
Correlating Significantly With the Student
Teachers' Posttest CAI Knowledge Subscale Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 15. | 0.393 | *22. | 0.720 | *25. | 0.635 | *43. | 0.312 | 55. | -.258 |
| *20. | 0.332 | 23. | 0.255 | *40. | 0.450 | *46. | 0.490 | 56. | -.257 |
| *21. | 0.515 | *24. | 0.357 | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level

Hypothesis 6: There are no significant correlations between the measures of the student teaching variables and the student teachers' reactions to teaching situations as measured by the TSRT.

The TSRT pretest and posttest scores, as indicated in Table 34 and Table 35, each correlated significantly with more than one-fourth of the student teaching variables.

The TSRT pretest scores have significant positive correlations with the student teachers' ACT social studies percentile, their scores on the CAI posttest composite and attitude subscales, their posttest grade level preferences, and their scores on most of the MTI:TP measures including both composite scores. The correlation ($r_s$=0.231, $n$=71) between the student teachers' pretest TSRT scores and their marital status just missed being significant and was in the direction of married students tending to have higher scores.

Table 34

Student Teaching Quarter Variables

Correlating Significantly With the Student

Teachers' Pretest TSRT Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8. | 0.318 | 30. | 0.249 | *41. | 0.514 | *47. | 0.510 | 72. | 0.400 |
| 22. | 0.294 | *37. | 0.521 | *43. | 0.490 | 56. | -.268 | *75. | 0.323 |
| *23. | 0.304 | *38. | 0.424 | *44. | 0.395 | 62. | -.251 | 76. | 0.250 |
| *24. | 0.369 | *39. | 0.311 | 45. | 0.282 | *67. | 0.400 | 79. | 0.260 |
| *28. | 0.666 | | | | | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Seven of the cooperating teacher variables correlated significantly with the TSRT pretest scores; the correlations with the cooperating teachers' scores on the MTI:SP Use of Textbook subscale and with their total number of student teachers were negative, while the correlations with four of the cooperating teachers' MTI:TP scores and with the year they last studied mathematics were positive.

The student teachers' TSRT posttest scores correlated significantly with all of the ACT scores except the mathematics percentile, with the TSRT pretest scores, and with the CAI composite posttest and both attitude scores. Both the pretest and posttest scores of the student teachers on the MTI:TP and three of its subscales also correlated significantly with the TSRT posttest scores. The cooperating teachers' MTI:SP Use of Textbook subscale again showed

a regative correlation with the student teachers' TSRT scores. The cooperating teacher variables having a significant positive correlation with the student teachers' posttest TSRT scores were the number of graduate hours in education and four of the MTI:TP measures including the composite posttest scores.

Table 35

Student Teaching Quarter Variables

Correlating Significantly With the

Student Teachers' Posttest TSRT Scores

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *5. | 0.453 | *22. | 0.385 | *38. | 0.347 | *45. | 0.453 | 71. | 0.270 |
| 6. | 0.312 | 23. | 0.298 | 39. | 0.250 | *47. | 0.579 | *75. | 0.357 |
| *8. | 0.496 | *24. | 0.415 | *41. | 0.430 | 56. | -.286 | 77. | 0.283 |
| 9. | 0.343 | *27. | 0.666 | *43. | 0.614 | 65. | 0.287 | 79. | -.293 |
| 19. | 0.333 | *37. | 0.429 | *44. | 0.502 | | | | |

*Indicates .01 sig. level; others are .05 sig. level.

Hypothesis 7: There are no significant correlations between the measures of the student teaching variables and the student teachers' participation in the project.

Appendix N, p. 233, indicates that the only student teaching variable to correlate significantly with project participation was junior project participation. The correlation (r.0.231, n-71) of project participation with school classification just missed being significant. This positive correlation was in the direction of urban

schools. The correlations of project participation with the scores on Massie's test of contemporary mathematics ($r_{=}0.244$, $n_{=}71$), with the pretest kind-of-school preferences ($r_{=}-.223$, $n_{=}64$), and with the number of classes taught by the cooperating teacher ($r_{=}-.221$, $n_{=}62$) were the only other correlations higher than .200.

The first six of the preceding seven correlational hypotheses for the student teaching quarter were rejected at the .05 level of statistical significance. The seventh hypothesis was not rejected.

# CHAPTER V

## INFORMAL ANALYSIS OF ADDITIONAL DATA

This chapter presents an informal analysis of additional data collected during the course of the study. The first part contains a comparison of the responses on the teacher and student forms of the Mathematics Teaching Inventory. This is followed by a discussion of responses from the $S_1$ questionnaires and supplementary comments from the project teachers' daily logs. The last sections summarize responses from the student teaching questionnaires and informally compare the project and non-project student teachers.

### A Comparison of the MTI:TP and the MTI:SP Responses

The two forms of the Mathematics Teaching Inventory were designed so that an item of one would usually have a corresponding item of the other describing the same classroom activity. An informal, comparative analysis of some of these items is presented in this section. A complete listing of the percentages of agreement with the key for parallel items of the MTI:SP and the MTI:TP is given in Appendix K, p. 225.

The students of both the cooperating teachers and the student teachers had a substantial (75 per cent or higher) amount of agreement with the keyed response for several items when responding to the description of their class.

The classroom students generally agreed that:

(4) their teacher and student teacher wanted them to speak up if they didn't agree with what the teacher had said.

(8) their teacher and student teacher did not discourage them from questioning their textbook.

(16) their teacher and student teacher asked questions that caused them to think about ideas they had previously studied.

(18) they often solved difficult math problems by considering easier problems.

(20) their teacher and student teacher gave them the opportunity to discuss in class the questions that were asked on their tests.

(24) their teacher and student teacher were willing to admit when they had made a mistake.

On each of the items of the MTI:TP designed to parallel those six items of the MTI:SP mentioned above, the student teachers and cooperating teachers had over 90 per cent agreement with the keyed response. For these items, then, there seems to be a high amount of agreement between the teachers, student teachers, and the university validating committee as to the appropriateness of these activities

as well as evidence from the students indicating these activities were occurring in their classrooms.

The responses to one item (#17 on the MTI:SP or #20 on the MTI:TP) were distinctive for they indicated general agreement between people in the public schools but disagreement with the key. Nearly 70 per cent of the student teachers and over 75 per cent of the cooperating teachers agreed that "Since much of mathematics is accumulative, a student should master a concept before proceeding to the next chapter." More than 75 per cent and over 85 per cent of their students, respectively, indicated that "Our teacher tries to get us to learn an idea completely before we go on to the next idea." Both of these sets of percentages as indicated in Appendix K, p. 225, are in the opposite direction of the keyed response determined by the university validating committee. These differences could be due to varied interpretations of the items or to contrasting curricular philosophies (a spiral curriculum orientation versus a hierarchial orientation, e.g.).

There were no items for which the teachers thought a particular activity should not occur but their students indicated otherwise.

There were items for which the reverse was true. Although a large majority of student teachers (96%) and cooperating teachers (97%) indicated that collecting numerical data and formulating related problems should be part of a students' experience in mathematics (item 10), less than 30 per cent of the student teachers' pupils and less than 25 per cent of the cooperating teachers' pupils

concurred with the statement, "We are sometimes asked to make up our own problems and to collect the numbers for them." Additional activities and strategies, having substantial endorsement by student teachers and cooperating teachers but not generally used according to their students, are given below. The cooperating teachers and student teachers generally agreed that:

(1) many important mathematical ideas may be taught through the use of games and puzzles.

(15) the student's role is more than learning what the teacher tells him.

(17) the textbook and the teacher's notes shouldn't be the only sources of mathematical knowledge for class discussion.

(31) students shouldn't be discouraged from guessing or estimating answers.

(36) mathematics classes should discuss how mathematicians discover mathematical concepts.

(37) a teacher should frequently use real world problems to introduce fundamental mathematical ideas.

(47) tests should contain problems which relate mathematics to other subjects.

The above student teacher and cooperating teacher perceptions were not compatible with their classroom activities as indicated by their students. Appendix K, p. , shows that about 75 per cent or more of the cooperating and student teachers generally agreed

with the seven items listed above, but only about 30 to 40 per cent of their students indicated that their teachers exhibited these activities in the classroom.

## Responses From $S_1$ Questionnaires

This section reports and summarizes responses to several descriptive and evaluative questions on the pre-student teaching block questionnaires (Appendix H, p. 209 ). Project pre-service teachers' expectations, their reasons for entering the project, the ways in which they have changed, the aspects of the program contributing most to their development, and their criticisms and suggestions for improvement are presented.

In response to the question What do you expect to get out of the project this quarter?, one-half of the project participants indicated they expected practical experience and/or an introduction to teaching. Nearly a third of the project members (15 of the 52) indicated an expectation of learning more about or gaining a better understanding of the inner city student and inner city schools. Others expected to become more proficient in methods of teaching (10), to obtain some knowledge of the educational system and how it affects students (8), to increase their confidence in teaching and handling discipline problems (6), to decide if they really want to or are able to teach (5), and to gain a background of what to expect in student teaching (2). The following are representative student expectations of the project.

"A true understanding of teaching and its related problems and anxieties."

"A professional and cultural introduction to teaching."

"To compare the two kinds of schools to see if I am prejudiced to the point of not being able to teach in one kind or another."

"To discover if I can handle a classroom situation and discipline problems."

"A better understanding of youth and what is actually being done in the schools."

"To develop methods to maximize my effectiveness and to make math more appealing and interesting to students."

"To learn some of the shortcomings of the present system and try to determine ways of improving it."

Why did you choose this program over the traditional program?

Two related attitudes clearly evident in the project members' responses to this question were a dissatisfaction with traditional education courses and a desire for direct teaching experiences in the public schools. Thirty-seven project teachers indicated a desire and preference for first-hand, practical school experiences. Thirty-six were dissatisfied with the traditional program which only "talks" education; many were tired of books, lectures, and "sitting in boring classes"; others felt too many education courses were practically useless. Some typical responses were:

"This program offered me more practical experience in the field of education by allowing contact with the schools. The first-hand experience seemed more important to me than the education courses which I have found to be rather dull and not quite as practical."

"I don't want to sit in a classroom working with hypothetical cases.... I need experience. I have

plenty of ideas - but no work in the schools to test them."

"I want to be where it's at, not behind a pile of books."

A few less typical responses include:

"Because of the exposure to inner city schools in comparison with outer city schools."

"This program permits me to make a definite decision to whether or not I'll like teaching."

"I believed that the experiences would be more meaningful when I put everything together. Experience is many times more helpful than theory acquired in a classroom. But a combination of theory and experience is even more helpful."

"Teaching is doing, observing, learning - a cumulative experience."

"It's time for a revolution in the present system and I see this program as a step towards an active role toward this end."

A few reasons for entering the project program were considerably less lofty:

"Only way to get a certificate in time for next year."

"Another course like Psych 230 would blow my mind."

"No real reason."

"I was talked into it."

"Facility in scheduling."

"Learned I could graduate sooner."

"I am above the present education system in my sincerity and interest."

The responses to What did you get out of the project this quarter? were quite diverse. Close to half (22) of the participants

indicated they had acquired a good introductory experience in teaching or had gained more knowledge and insight into the many aspects of teaching. One-fourth of the project teachers mentioned their experiences in or exposure to different schools and contrasting cultures; several felt they had a better idea of the differences between inner city and outer city schools. Nine students said they were exposed to many methods and ideas for classroom teaching, eight indicated a fuller realization of the problems in teaching, and seven mentioned an increased understanding of students and teacher-student relationships. Increased self-confidence in teaching ability (8), a successful preparation for student teaching (5), a new appreciation for the teaching profession (5), a self-examination of strengths and weaknesses as a teacher (5), and a new excitement or reinforced desire with respect to teaching (4) were additional outcomes of the $S_1$ quarter mentioned by several project teachers. Other selected comments concerning outcomes of the pre-student teaching block are presented below.

"A great deal of good resource material and reading."

"Learned different ways to get students involved."

"I think the observations of the students' behavior were as valuable as the teaching experience."

"Students vary in attitude much more than I expected."

"Doubts about the goals and methods of the educational system."

"An awareness of the frustration of not getting through to the students."

"Some good evaluations of what I do in a classroom."

"I need to gain more knowledge of math."

"Good understanding of a public school system."

"Realize the value of using games and puzzles in class."

"How to relate to a class full of discipline problems, students who hate math and school."

"There isn't one philosophy of education I can adopt completely."

"Became exposed to many viewpoints through the seminars."

"Learned I was too idealistic about teaching."

In what ways have you changed since you've been in the senior project? About one-third of the project teachers thought they were more confident, could express themselves better, or had less anxiety than before they entered the project. Ten felt they were more aware of the problems that exist in teaching or had a better knowledge of teaching. Ten project pre-service teachers also indicated they had improved their attitude toward or increased their knowledge of blacks and inner city students.

"I have become much more committed to helping black people."

"My racial biases and fears have been suppressed."

"I'm no longer afraid of an inner city school - the students weren't as bad as I expected."

A few indicated misgivings about teaching in an inner city school.

"I've changed my opinion toward the inner city schools. I never thought I could teach there, but I've gained an awareness of their problems. I still would rather teach outer city, but I feel I could attempt inner city if necessary."

"I don't think I could teach in an inner city school and be happy."

"I don't think I would do very well in an inner city school."

Other changes indicated by project participants were greater maturity, wisdom, sincerity, awareness, or seriousness (7), a more realistic or less idealistic outlook about teaching (6), and a greater interest in or enthusiasm for teaching (6). Additional, selected comments are given below.

"When I entered math education I was in no way 'dedicated' to teaching, but I thought maybe in a few years I'd grow to even 'like' it. Wow! I love it! I never thought last January I could change so much in ten weeks! I can hardly wait to start student teaching."

"Before this quarter I more or less accepted what was being done in the schools. Now I'm not sure if educators are teaching the right things. Why teach a kid to factor a polynomial? He'll never see another one in his whole life unless he goes to college. Even at college he won't be at a big loss unless he takes up a math-oriented field."

"I'm much less critical of other teachers."

"I am a firmer believer of strict discipline in the classroom."

"More interested in reading to increase my own knowledge and improve my teaching methods."

"I don't have a mustache any more."

"More discouraged about the apathy and disinterest of so many teachers, more frustration with administrations, and more discouragement at the prospect of hunting for a teaching job."

"My view of the teacher-student relationship has changed tremendously. I used to feel that the student was to saturate all the knowledge the teachers dispersed. Now I believe the teacher is more or less indirectly related to the learning experience."

What aspects of the program have contributed most to your development? Forty-five (nearly 90%) of the fifty-two project teachers chose active participation in the schools or the actual classroom teaching experience as making the greatest contribution to their development during the $S_1$ quarter. The mathematics methods seminars were also frequently mentioned (20), particularly those seminars relating to the problems and concerns of the schools. Other aspects of the program thought to be important by at least a few participants were: comments, criticisms, and evaluations by the project staff and classroom teachers (8); being in two different schools with exposure to black students (6); the field trips, particularly to Cleveland (4); and philosophy of education (3). The speakers in general sessions, talks with others in the project, the informal attitude of the project staff, the opportunity to work with individual students, observations of other teachers, and outside readings were also mentioned.

> "Ideas from other project members probably helped me the most."

> "My log was the most important contribution. Had I not taken the time to really reflect about what I had done and was doing, the other aspects (in-school work, special methods, and readings) would not have had nearly the effect they had."

The most frequent criticisms of the project by its participants centered around the course in philosophy of education. Most of the twenty-three project teachers who criticized this part of the program on the questionnaire felt that it didn't "fit in at all with the rest of the project" and had "little practical value." Several

people thought philosophy of education should be eliminated as part of the project. Others thought it was too structured or "was just a separate course I was taking."

Fifteen project members mentioned that the special methods seminar could be improved. Some thought this seminar should be more structured; others felt more effort should be spent on relating the seminar to the problems encountered in the schools.

Ten people indicated that the project was very time demanding and time consuming. Seven participants, including several of the most thoughtful and responsible students, felt there should be more evaluation and supervision of their work in the schools. Four project members mentioned that the coordination between the schools and the university could have been better; some administrators and classroom teachers were not "well enough informed about what we were doing or what they were to do with us." A few $S_1$ seniors indicated a desire for more on-campus discussion about school activities and problems. Other selected criticisms are listed below:

> "My main gripe is that one has a hard time differentiating between the causes of the problems and attitudes of the inner city schools and those of the suburban schools because of the change in grade levels and ethnic population of the schools."
>
> "The change from outer to inner and senior high to junior high were too much taken together for us to be able to sort out the differences in any logical manner."
>
> "More time should be allowed to do readings."
>
> "There should be a better selection of cooperating teachers; one was great and one was not."

"The selection of schools was too limited; not enough variety of types."

"The one thing that really bothers me is that this project is directed greatly at the inner city level of teaching; the whole scope of teaching is not in the inner city."

"There was not enough feedback among the different groups at different schools."

"The science and math groups should get together more often."

"It's a good idea to spend time in the schools but by the time you've been through the junior project and observed teachers and schools, it seems worthless to spend time observing other teachers during senior project."

In addition to explicit or implicit suggestions for improving the project mentioned above, the project teachers had a wide variety of other suggestions. A sampling of these is presented below.

"Give us more time to do things; how about some time to meditate?"

"Introduce the use of computers for test evaluation early in the quarter and let us use them as we spend time in the schools throughout the quarter." (This change was implemented for the Winter project group.)

"The orientation trips came to soon; I didn't know what to ask because I didn't know anything about teaching to begin with." (A modification was made for the Winter project group.)

"Replace a few of the teachers who aren't innovative in their methods; in observing I want to see new ideas."

"Arrange a program in a school where the members of the project can evaluate each other."

"Have a two-week course in evaluation given by one of the evaluation-education professors."

"I would like to see more guest speakers."

"Discuss how to teach for individual differences in the classroom."

"More interaction between team partners; more discussion between students."

"There should be a closer relation between what is being done in special methods and what the students are experiencing in the schools; more student involvement in special methods."

"Have more individual conferences."

"We should have more evaluations and observations of our teaching in the schools."

"Have the schools differ in grade level or economic level, but not both."

## Comments From Daily Logs

The daily logs kept by the $S_1$ pre-service teachers gave them an opportunity to reflect upon and react to their project experiences. In addition, it was an important source of feedback for the project staff throughout the quarter. The following comments were chosen to supplement the previous responses from the questionnaires. They deal with school experiences, the special methods seminars, and the project in general.

### School experiences

"I enjoyed working in the schools very much. I felt at times we were imposing on the schools and that they and the teachers were confused as to how we differed from student teachers."

"I spent one period this week learning how to use the Wang Calculator. I haven't learned to program

the machine, but one of the students told me that he's learned how to program it, and he feels that it has helped him a great deal in his algebra course. He claims that without it, he might be failing the course. What is this machine doing that his teacher is failing to do?"

"I have learned that the greatest disciplinarian may have quiet but he may not teach anything if he does not hold the attention of his students. Teaching everything by the book can work but can also be extremely boring.... I think math can be much more interesting than it is being presented."

"Today I helped students finish up their worksheets. Some still don't have the slightest idea of what's going on. I seem unable to give them an actual insight and end up trying to teach method of solution and am not always successful at this. Oddly enough I seem to be having better luck with the modified class, possibly because I expect less."

"One thing that has been encountered in the schools during observation is the general consensus by the teachers that discovery lessons, while very nice theoretically, just don't work, at least in their experience. Why do they say this? Does it take a particular kind of teacher or special students to make a discovery lesson work?"

"I learned today that when you ask a pupil if he understands what you've said, that isn't enough."

"I think tutoring is a good experience to have before actual classroom teaching since it gives me a feeling for the different types of problems individuals encounter."

"I really enjoyed teaching today. I was comfortable with my lesson plan and was well-prepared. I knew what I wanted to do, where I was headed, and it was a very good feeling when the students responded as I expected and was striving for."

Special Methods Seminars

"I think the methods part of the project is helping me in the schools. It helps us with lesson

plans, particular problems, and gives us other techniques for explaining things."

"We discussed lesson plans which I, myself, find no use for. I think a teacher should study and know what he is going to present and let it go from there - each class is different and no lesson plan can cover that."

"The things we're doing in special methods are turning out to be interesting and appropriate for us in preparing for teaching. Having to make a lesson plan which I plan to use in the actual high school classroom will give me a good chance to test out the workability of what I put on paper."

"Our special methods session was very good today - I think splitting the time between discussion about our experience in school and content is an excellent idea."

"In the education project we have little direct formal contact with mathematics. If we could get a little back in touch with mathematics that really makes us think, we could, in addition to studying methods, continue to stretch our minds with regard to our subject matter."

"I feel that our special methods are not filling a needed objective; how to relate to modified and regular classes. We are being idealistically trained to an advanced class level."

"Looking at basic algebraic concepts from a more naive point of view is more difficult than I had thought it would be. Many of the things I've taken for granted through the years are coming out into the open and need clarification if I am to be capable to teaching these to students seeing them for the first time. Trying to teach these ourselves as was done in class seems a good method even though the thought of standing in front of fellow students makes me a little uneasy."

"Probably the most valuable aspect of special methods in terms of lasting influence on my role as a teacher is the handouts I received. Handouts varied in nature from 'fun' things to do in the classroom to serious concepts and procedures in math education. From all of this

material, I can now start a resource file upon which I can build every time new material is available."

Project in General

"I have truly enjoyed my quarter in the project. Most of all, I think that I appreciated the opportunity to begin my teaching experiences in a group atmosphere, working with other students that I really got to know during the quarter."

"The senior project thus far has completely ignored the problems of rural education. Why is this so? Why don't we do any observing or student teaching in rural schools?"

"The Tuesday afternoon grab-bag is far more exciting (than special methods), if for no other reason, by its uncertainty. All the guest speakers to one degree or another have entertained and educated me. From the discussion follow-up I abstain. I deplore the current craze for breaking up into small groups unless it is for dinner or sex."

"Other than the actual classroom experience, I found tutoring to be the most helpful experience."

"I wish that there was a math course offered in Math Ed., whose sole purpose would be to explore many of the subject areas one may teach and review the basic ideas and concepts."

"No one has yet asked - that I heard - 'How do we get children to want to learn?' To me, this is our only real problem...."

## Responses From Student Teaching Questionnaires

This section summarizes responses from several descriptive and evaluative questions on the student teaching questionnaires (Appendix I, p. 215 ). The student teachers' previous experience with young people, their reasons for choosing teaching as their profession, their

views on the importance of mathematics, the aspects of student teaching contributing most to their development, and their criticisms and suggestions for improvement are presented.

The student teachers' responses to What previous experience have you had in working with young people? indicated considerable formal as well as informal teaching experience prior to student teaching. Almost 40 per cent of the student teachers (27 of 71) mentioned some previous type of teaching experience other than tutoring. About half of these included a variety of classroom teaching experiences such as substitute teaching, student teaching in another area, actual junior high school teaching, and observations and teaching related to university programs or courses. One student had taught a college math course and another had acquired three years of experience as a teacher's aide. The other teaching experiences dealt with instruction in first aid, driver's education, astronomy, baton twirling, modern dance, piano, swimming, etc. In addition, more than one-fourth of the student teachers indicated experience in tutoring. Other activities frequently mentioned were coaching and umpiring (12), church work (16), camp counseling (5), scouting (6) and baby sitting or caring for younger sisters and brothers (8). A dozen people (all project participants) indicated they had no previous experience in working with young people.

The responses to Why did you choose teaching as a profession? revealed that more than one-half of the project group and about one-third of the non-project group chose teaching because they enjoyed

working with and helping young people. Nearly one-fourth of the teachers thought that teaching would be a rewarding and gratifying profession. The same number, sixteen, also felt they could improve the educational system or make their best contribution to society by teaching. Eight pre-service teachers thought teaching would be a challenge, while five indicated that their enjoyment of or competency in mathematics had been influential. A few mentioned that they chose teaching because of the good and bad math teachers they've had. Only three indicated that they liked school or the school atmosphere. Several teachers mentioned more pragmatic reasons for entering the teaching profession: "probability of work," "ability to travel during time off," "dropped out of engineering and education seemed the natural step," "a wonderful profession for a woman," and the "prestige of the teacher in the community." A few additional reasons for choosing teaching are quoted below.

> "Not originally interested but became 'hooked' once involved with teaching."
>
> "A good background to have in case I go into something else."
>
> "A childhood dream which stuck."
>
> "I was undecided what field to enter."
>
> "A way to effectively communicate with people."
>
> "Had a knack and patience for explaining things to my peers in high school."
>
> "A desire to reverse the wholesale destruction of creativity and intellectual integrity that presently is referred to as teaching."

Who or what had the greatest influence on you to enter education? A majority of the pre-service teachers (31 project and 8 non project) felt that their former teachers, usually high school mathematics teachers, were most influential. As often as not, it was the poor teachers as well as the good ones, who had been influential in their decision to enter education.

> "A number of fine teachers have instilled in me a great respect and admiration for the profession; but more the poor teachers I have known press me to seek improvement."

Sixteen pre-service teachers indicated relatives or friends had been influential. Previous teaching or tutoring experiences were mentioned by six of the prospective teachers. Other comments were less easily categorized including the following three unique responses:

> "Discovery of the project - I never considered education before, because I didn't want to take the rinky-dink education courses."

> "Jesus and my wife."

> "Realizing how impersonal and useless my role was as a small part of a giant corporation for four years."

Why did you select mathematics as your major? Approximately 2 out of 3 pre-service teachers mentioned their enjoyment of or interest in mathematics in response to the above question. About one-half of the group indicated competency in mathematics was a factor in their choice. Seven students said they were influenced by former mathematics teachers, six felt math was important to problem

solving and applications in the physical world, and five thought mathematics would be a challenge.

Why is it important that students learn mathematics? This question was included on each of the questionnaires for project and non-project teachers. The responses were found to be very stable from pretest to posttest during the pre-student teaching block and the student teaching quarter. Project and non-project teachers also had quite similar responses with respect to percentages in each category.

About 75 per cent of the pre-service teachers indicated that mathematics was a necessity for or had practical applications to everyday life. Around 50 per cent thought that mathematics aids the process of logical, orderly thinking or helps to attain powers of reasoning and understanding. Approximately 20 per cent of the prospective teachers mentioned that mathematics cultivates good techniques for problem solving or helps one to analyze and resolve problems. Other more frequent responses included the importance of mathematics for occupational opportunities and careers, and its relation to other academic fields and higher learning. Some selected responses are presented below.

> "To be functional in today's society demands that the individual have at least a minimum understanding of mathematics, and for society to be functional demands that a certain percentage of its individuals have a maximum understanding of mathematics."

> "You need math to get out of high school."

> "I don't know. Mathematics can be useful in many situations, but there are successful people who have little knowledge of mathematics. Math is as important as history or English or any of the other subjects, but not more important."

"Math increases the freedom of the individual by increasing his capacity to respond in various situations."

"Math is a part of our culture, so students should learn it."

"I question the importance for some students to learn anything in the classroom unless they want to."

"It is probably not important that they do."

"It's interesting and fun."

"I don't know the answer to this question and I'd really like to find out because I'm sure my students will one day ask the same thing."

"Because the learning process, expecially in math, can be an exciting and valuable part of anyone's life."

"I don't know. There are practical reasons to learn math but there are practical reasons to learn lawn care or auto mechanics. Yet we don't feel compelled to teach gardening or mechanics. The intellectual gymnastics associated with mathematics could also be accomplished by other subjects such as philosophy."

"Math is of secondary importance. Students are the primary source of my teaching."

"Everyone uses math in his daily life and the growth of a nation and the well being of its people can be insured by the wise employment of math."

What aspects of the student teaching quarter have contributed most to your development? Nearly one-half of the pre-service teachers indicated that the actual classroom instruction or the teaching experience itself made the greatest contribution to their development during student teaching. Fifteen students felt working with their cooperating teacher, trying to reach his expectations, or having conferences with him contributed most to their development. Other

responses mentioned several times were: the opportunity to take over complete responsibility of a classroom (10); talking with students individually, tutoring them, or dealing personally with their problems (9); sitting, discussing, and listening to conversation in the teacher's lounge (3); and discipline problems (3). Other aspects of student teaching indicated as making significant contribution to the prospective teachers' development are presented below.

"Taking over my cooperating teacher's full load."

"Teaching modified classes whose attention to math was very minimal."

"Conferences with my (college) supervisor."

"The opportunity to work in a culturally different school."

"Learning to anticipate many of the student's questions."

"Figuring out ways to evaluate and ways to stop cheating."

"The mini-research which enabled me to learn more about testing."

"Planning and presenting lessons."

"The fact that my cooperating teacher put no pressure on me to teach his way."

What criticisms do you have concerning your student teaching experience? The most frequent response to the above question was "None." Twenty-two of the seventy-one student teachers indicated that they had "no criticisms, really" or that "the only criticisms are of myself." Eight pre-service teachers thought the seminars were not productive or necessary every week. Five mentioned the research

project did not add to the learning experience, and six said that student teaching was too short. Three indicated their cooperating teacher either placed too many limitations on them or else offered little guidance. Several were strongly against doing student teaching in the spring, because "the year is almost over, student interest is fading, the students are set in the patterns of the cooperating teacher, and they have difficulty adjusting." Additional criticisms are given below.

> "I followed too closely my cooperating teacher's methods - but of course she was accountable. I would have done some things differently. I was not always myself with the class."
>
> "After $S_1$, student teaching is almost easy."
>
> "For me it was great. However, the cooperating teacher can make or break such an experience."
>
> "I don't think that student teaching has been practically productive. I think more student teachers try to find their own style or method of teaching with little guidance or help from anyone else."
>
> "I should have taught all day."
>
> "My cooperating teacher offered very little help. Even though this has its good points, I feel a few more visits by him into my classroom would have helped me considerably."
>
> "I had good supervision and a good cooperating teacher. I really feel that my student teaching experience was open-ended enough to let me do what I wanted."
>
> "The class situation changed too much when the supervisor was present."
>
> "The students didn't always feel that I was their 'real' teacher."

"The administration should become closer to the student teacher by talking with him and perhaps observing his classes."

In addition to the implicit or explicit suggestions made above, the student teachers indicated other suggestions for improving the student teaching experience. One difference noted between project and non-project responses was the indicated desire of several of the non-project teachers for earlier or different types of direct experiences, whereas the project participants did not. Representative suggestions for improving student teaching are given below.

"Student teachers should spend the entire day in the school and teach a full load of courses."

"Student teachers should be required to become active in some extra-curricular activity."

"There should be more supervision; a variety of supervisors with a variety of ideas."

"Spread student teaching over two quarters, but have different classes each quarter."

"Try to get the best possible cooperating teachers."

"The ability to more freely select content areas could have helped tremendously."

"Require student teachers to attend teacher's meetings and become more involved with things that go on outside the classroom."

"I would have liked more responsibility to make me feel more like an integral part of the school."

"Student teaching could be improved by having more of a lab structure - productive seminars where a group of student teachers with guidance from staff (OSU and school) would develop units. Then student teachers could present the units to classes for a week or so. Analyze the results. Make changes. Plan other units."

"The ten weeks of student teaching could be divided into two five week sections which could be spent at different schools. This would give the student teachers an opportunity to study different teaching situations and to apply what they learn in the first five weeks to their classes in the second five weeks."

"It might help if we could get some feedback from the students during the quarter on how they feel we are doing."

"It's structured very well right now. When things go wrong it's not the fault of the set-up but usually the fault of how people have been paired up and I can't see where problems of pairs can be foreseen."

"My experience seemed excellent. Perhaps it is because I had heard so many negative criticisms about student teaching before I went into it that my experience seemed so beautiful."

## Comparison of Project and Non-Project Teachers

This section investigates additional data obtained from the pre-student teaching block and student teaching questionnaires with respect to the grade level preferences, the kind-of-school preferences, the type-of-student preferences, and the commitment to teaching of the project and the non-project pre-service teachers. An informal discussion of the scores of the project and non-project student teachers on the Checklist for the Assessment of Teachers, the Cultural Attitude Inventory, the Teaching Situation Reaction Test, and the Mathematics Teaching Inventory is presented.

Table 36 indicates that the project teachers grade level preferences remained relatively stable until the student teaching quarter.[1] The biggest changes occurred in the junior high and senior high categories. By the completion of student teaching, the number of project teachers preferring junior high school had increased from 23 per cent to 44 per cent. The number preferring senior high dropped from 73 per cent to 52 per cent. The non-project grade level preferences had little change; they consistently favored senior high over junior high in the ratio of approximately 3 to 1.

Table 36

Grade Level Preferences of

Project and Non-Project Teachers

| | Elementary | Junior High | Senior High | College | Undecided |
|---|---|---|---|---|---|
| Project $S_1$ Pre | 0% | 21% | 69% | 0% | 15% |
| Project $S_1$ Post | 0% | 23% | 71% | 4% | 10% |
| Project $S_2$ Pre | 0% | 23% | 73% | 4% | 8% |
| Project $S_2$ Post | 0% | 44% | 52% | 2% | 8% |
| Non-Project Pre | 13% | 22% | 78% | 0% | 4% |
| Non-Project Post | 4% | 26% | 74% | 4% | 4% |

[1] Since some teachers indicated more than one preference, the total percentages in the tables frequently exceeded 100%.

Percentages of kind-of-school preferences of the project and non-project teachers are given in Table 37. The percentages of pre-service teachers choosing suburban schools dropped during the student teaching quarter,

Table 37

Kind-Of-School Preferences of

Project and Non-Project Teachers

| | Urban | Intermediate | Suburban | Rural | Undecided |
|---|---|---|---|---|---|
| Project $S_1$ Pre | 8% | 23% | 21% | 17% | 31% |
| Project $S_1$ Post | 8% | 39% | 42% | 19% | 0% |
| Project $S_2$ Pre | 8% | 38% | 46% | 17% | 0% |
| Project $S_2$ Post | 8% | 38% | 31% | 15% | 17% |
| Non-Project Pre | 0% | 30% | 48% | 22% | 9% |
| Non-Project Post | 0% | 39% | 35% | 17% | 13% |

while the number of teachers undecided about their type-of-school preferences increased (especially for project student teachers). Only four project teachers and no non-project teachers indicated a preference for working in urban schools.

Table 38 indicates quite similar percentages with respect to type-of-student preferences for project and non-project teachers. At the completion of the student teaching quarter, there was a slight

Table 38

Type-Of-Student Preferences of

Project and Non-Project Teachers

| | Slow | Average | Accelerated | Special | Undecided |
|---|---|---|---|---|---|
| Project $S_1$ Pre | 2% | 56% | 17% | 2% | 25% |
| Project $S_1$ Post | 6% | 64% | 19% | 2% | 21% |
| Project $S_2$ Pre | 2% | 67% | 19% | 2% | 23% |
| Project $S_2$ Post | 8% | 56% | 25% | 2% | 19% |
| Non-Project Pre | 4% | 61% | 9% | 0% | 26% |
| Non-Project Post | 9% | 65% | 30% | 0% | 9% |

increase in the number of student teachers preferring to work with slow and accelerated students, but the majority still indicated a preference for working with average students.

Table 39 shows that about 3 out of 4 project teachers indicated that their commitment to teaching was greater at the end of the $S_1$ pre-student teaching block than when they began this experience. Two $S_1$ teachers felt that their commitment was less. Following student teaching, twenty-five project teachers thought their commitment was greater, twenty felt it was the same, and three indicated it was less. Nine of the non-project student teachers said that their commitment to teaching was greater, while fourteen felt that their commitment was the same.

Table 39

Responses Concerning Commitment to Teaching

For Project and Non-Project Teachers

| | Greater | Same | Less |
|---|---|---|---|
| Project $S_1$ Post | 71% | 25% | 4% |
| Project $S_2$ Post | 52% | 42% | 6% |
| Non-Project Post | 39% | 61% | 0% |

In order to further compare the project and non-project students, t-values were computed on the means of the pretest and posttest criterion measures for these two groups. No significant differences were found on any of the measures. Additional tests on several other variables failed to reveal significant differences. Table 40 presents a summary of the means and standard deviations used in this informal, comparative analysis. The means for the non-project student teachers were higher than those of the project group on the posttest MTI:TP, the posttest TSRT, and the CFAT:PP, and just slightly higher on the MTI:SP. The project student teachers had higher means on the TSRT, all of the pretest and posttest CAI measures, and all of the CFAT:SP measures.

Table 40

Means and Standard Deviations for Project and Non-Project Student Teachers on the MTI, CAI, TSRT, and CFAT

| | Project | | | | Non-Project | | | |
|---|---|---|---|---|---|---|---|---|
| | Pretest | | Posttest | | Pretest | | Posttest | |
| MTI:TP | Mean | S.D. | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| Composite | 189.3 | 10.7 | 185.7 | 11.6 | 189.3 | 10.9 | 188.3 | 16.6 |
| Teacher-Pupil Roles | 32.9 | 3.0 | 32.0 | 3.2 | 32.8 | 3.8 | 33.2 | 2.9 |
| Use of Textbook | 34.7 | 2.8 | 33.8 | 2.7 | 35.7 | 2.0 | 34.7 | 3.3 |
| Design and Use of Tests | 31.5 | 3.3 | 30.8 | 3.2 | 31.0 | 2.5 | 30.5 | 3.4 |
| Strategies of Teaching Math | 90.2 | 6.8 | 89.1 | 6.9 | 89.8 | 7.1 | 90.0 | 9.8 |
| Mathematical Orientation | 19.4 | 3.6 | 19.5 | 3.2 | 20.1 | 3.7 | 20.5 | 3.2 |
| MTI:SP | | | | | | | | |
| Composite | | | 20.5 | 1.5 | | | 20.8 | 1.7 |
| Teacher-Pupil Roles | | | 6.9 | .6 | | | 7.2 | .7 |
| Use of Textbook | | | 4.8 | .4 | | | 4.8 | .6 |
| Design and Use of Tests | | | 3.8 | .5 | | | 4.0 | .3 |
| Strategies of Teaching Math | | | 4.9 | .8 | | | 4.8 | .7 |
| CAI | | | | | | | | |
| Composite | 192.4 | 10.6 | 187.0 | 12.6 | 189.7 | 6.3 | 183.5 | 10.2 |
| Attitude | 108.4 | 7.2 | 105.0 | 8.3 | 107.9 | 5.2 | 103.0 | 7.2 |
| Knowledge | 72.0 | 5.2 | 70.9 | 5.7 | 70.1 | 3.2 | 69.5 | 3.8 |
| TSRT | 211.0 | 13.8 | 202.1 | 16.9 | 210.3 | 13.8 | 205.3 | 16.9 |
| CFAT:SP | | | | | | | | |
| Composite | | | 39.9 | 6.8 | | | 38.3 | 6.8 |

Table 40 (con't)

| | Mean | S.D. | Mean | S.D. |
|---|---|---|---|---|
| Teacher-Pupil Relationships | 19.4 | 3.8 | 19.0 | 3.7 |
| Personal Adjustment | 20.5 | 3.4 | 19.2 | 3.6 |
| CFAT:PP | 18.7 | 2.3 | 19.5 | 1.5 |

# CHAPTER VI

## SUMMARY, CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

### Summary

This study was a formative evaluation of an evolving pre-service teacher education program in secondary mathematics education at The Ohio State University during the 1970-71 academic year.

The program was a cooperative effort with the Columbus schools. It was designed to integrate the theoretical and practical components in pre-service teacher education by combining varied campus and community activities with increasing and diverse school responsibilities.

This program (project) operated concurrently with the traditional program (non-project). The project teachers were pre- and posttested during their pre-student teaching block (n=52) and posttested during their student teaching experience (n=48). The non-project teachers (n=23) were pre- and posttested during the student teaching quarter.

The major objectives of the study were to explore the patterns of change and correlational relationships for project teachers during the pre-student teaching quarter and for both project and non-project

teachers during student teaching. This exploration focused on the following five criterion variables:

(1) perceptions about what should occur in secondary mathematics teaching as measured by the Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP),

(2) compatibility to teach in culturally deprived schools as measured by the Cultural Attitude Inventory (CAI),

(3) attitudes toward culturally deprived students as measured by the CAI attitude subscale,

(4) knowledge of culturally deprived students as measured by the CAI knowledge subscale,

(5) reactions to classroom teaching situations as measured by the Teaching Situation Reaction Test (TSRT).

Another objective of the study was to develop two instruments having similar items pertaining to the teaching of secondary school mathematics. One instrument, the Mathematics Teaching Inventory: Teacher Perceptions, assesses a teacher's views of what should occur in secondary mathematics teaching. The other, the Mathematics Teaching Inventory: Student Perceptions, ascertains the students' perceptions of the strategies and activities actually used by the teachers.

Null hypotheses concerning the patterns of change and correlational relationships were tested at the .05 level of significance.

Additional data from questionnaires and daily logs were also analyzed.

## Conclusions

### Pre-Student Teaching Quarter

The project teachers held significantly more positive views of what should occur in the secondary mathematics classroom at the end of the pre-student teaching block than at the beginning. The changes in the TSRT and CAI measures were also more positive but not significant.

Questionnaire responses and log reactions indicated that project teachers were enthusiastic about the program, particularly their in-school experiences.

The correlations investigated for the pre-student teaching block suggest the following relationships.

Project teachers having higher MTI:TP posttest scores tended to have a higher grade point average in the pre-student teaching block, to be more compatible to teach in culturally deprived schools, to have more positive attitudes toward culturally deprived students, and to have more positive reactions to teaching situations.

There was a tendency for project teachers who had higher composite CAI posttest scores to have a greater commitment to teaching, more positive attitudes toward and greater knowledge of culturally deprived students, a pretest preference for urban schools, and more

favorable posttest views of what should occur in secondary mathematics teaching.

Project teachers with more favorable posttest attitudes toward culturally deprived students tended to have greater knowledge of culturally deprived students, to have more positive pretest reactions to teaching situations, to prefer urban schools, and to have more favorable posttest views of what should occur in secondary mathematics teaching.

Project teachers having more favorable posttest reactions to teaching situations tended to belong to the winter project group, to have higher ACT scores, to have more favorable attitudes toward and greater pretest knowledge of culturally deprived students, to be married, and to have more favorable posttest views about what should occur in secondary school mathematics teaching.

Student Teaching Quarter

The most dramatic result of the study was the significant losses evidenced by the pre-service teachers on each of the five criterion measures during the student teaching quarter. Cultural attitudes and reactions to teaching situations had the greatest negative change. Both project and non-project student teachers exhibited losses for each criterion variable.

No significant differences were found between project and non-project student teachers on the criterion measures. A substantially greater percentage of project than non-project student teachers

indicated an increased commitment to teaching and a posttest preference for junior high school teaching.

The correlations determined for the student teaching quarter suggested the following relationships.

Student teachers having more favorable ratings from their students regarding the activities and strategies used in their teaching of mathematics tended to have higher ACT percentiles, to receive higher ratings by college supervisors and students with respect to their teacher-pupil relationships, to have a higher grade point average upon entering education, and to have pretest type-of-student preferences in the direction of accelerated students. Their cooperating teachers tended to have more favorable student ratings on their classroom activities and strategies and tended to have a pretest disciplinarian view of mathematics.

Student teachers having higher MTI:TP posttest scores tended to have: higher ACT scores, higher grade point averages before entering education and in the pre-student teaching block, higher CAI and TSRT pretest and posttest scores, posttest preferences for higher grade levels, and a posttest disciplinarian orientation toward mathematics. Their cooperating teachers tended to have higher pretest and posttest MTI:TP scores.

Student teachers having a greater posttest compatibility to teach in culturally deprived schools tended to have: a greater commitment to teaching, more favorable attitudes toward and a greater knowledge of culturally deprived students, higher TSRT and MTI:TP

scores, and a posttest disciplinarian orientation toward mathematics. Their cooperating teachers tended to receive lower student ratings on their use of textbooks, to have studied mathematics more recently, and to have more favorable posttest views concerning strategies of teaching mathematics as measured by the MTI:TP.

Student teachers having more favorable posttest attitudes toward culturally deprived students tended to: be older, have higher ACT social studies percentiles, have a greater commitment to teaching, have greater knowledge of culturally deprived students and more favorable reactions to teaching situations, prefer urban schools (pretest), have more favorable views of what should occur in secondary school mathematics teaching, and have a posttest disciplinarian orientation toward mathematics. Their cooperating teachers tended to have studied mathematics more recently and to have more favorable views of what should occur in secondary school mathematics teaching.

Student teachers having a greater posttest knowledge of culturally deprived students tended to have: a greater commitment to teaching, participated in the junior project, more favorable attitudes toward culturally deprived students, and more favorable posttest views of what should occur in secondary school mathematics teaching.

Student teachers having more favorable posttest reactions tended to have: higher ACT percentiles (all except mathematics), higher grade point averages in the pre-student teaching block, more favorable attitudes toward culturally deprived students, higher TSRT pretest scores, and more favorable views of what should occur in secondary school mathematics teaching. Their cooperating teachers tended to

have lower student ratings on their use of the textbook, more graduate hours in education, and more favorable posttest views of what should occur in secondary school mathematics.

## Discussion

The student teachers' losses on each of the five major criterion measures during student teaching support the contention of critics, such as Silberman, that something is wrong with student teaching. One might be tempted to explain away the losses as follows.

In addition to student teaching itself, Black History Week, the defeat of a school bond issue and levy, racial disturbances resulting in the temporary closing of a few schools, and the impact of the job market could have been influential in affecting student teachers' attitudes.

Some pre-service teachers, particularly those in the project, voiced dismay over the repeated administration of the instruments used in this study. Instrument fatigue could have contributed to the losses incurred during student teaching.

Since the project teachers had generally higher scores on the criterion measures during the pre-student teaching block, some regression of their scores toward the mean would be expected during the student teaching quarter.

The reliability and validity of the measuring instruments are limitations that can not be discounted. The pre-service teachers' significant losses with respect to knowledge of culturally disadvantaged

students is an outcome few would expect and exceedingly difficult to explain within the realm of the student teaching experience alone.

One could interpret the student teachers' losses as decreased idealism and increased realism. If the goal of teacher education is to prepare prospective teachers for a role in the schools as they now exist, then perhaps too much time prior to student teaching is spent talking about what teaching should be like instead of what the schools permit. But a certain amount of idealism is a requisite for constructive change and improvement.

In contrast to the decreases evidenced on the criterion measures, the student teachers' responses to the questionnaires indicated generally favorable reactions to the student teaching experience. When asked to give their criticisms of student teaching, the student teachers most frequently indicated that they had none. About one-half of the student teachers felt that the actual classroom teaching experience made the greatest contribution to their development, and over one-fifth mentioned the influence and help of their cooperating teachers. Although supportive data were not collected, several experienced cooperating teachers personally mentioned that the project teachers were more poised at the beginning of student teaching, more ready to learn, and more sensitive to the characteristics of children than typical student teachers. This may be a result of the project teachers' familiarization with the public school system prior to student teaching. It could also be due, in part, to the fact that project teachers are presented and associated with several models of

teaching before the student teaching experience. These comments are compatible with a large body of literature indicating the importance and influence of the cooperating teacher and citing student teaching as the most valuable part of pre-service teacher education.

In the opinion of this researcher, the above mentioned possible influences do not singularly nor collectively completely account for the student teachers' significant decreases on each of the five criterion measures. Although the criterion variables generally intercorrelated significantly, most of them were measuring quite different dimensions of the student teaching experience. The pattern of losses on these measures was the same for each of the fall, winter, and spring quarters. Both project and non-project teachers evidenced losses on each of the criterion measures. The significant losses incurred by prospective teachers during student teaching are consistent with a considerable amount of literature. Several research studies discussed in Chapter II have indicated different types of attitudinal changes in the negative direction for pre-service teachers during their student teaching experience. Critics of teacher education, such as Silberman, have indicated that "compared with the kind of clinical training teachers should and could receive, practice teaching falls woefully short of the mark....practice teaching may do more harm than good, confirming students in bad teaching habits rather than training them in good ones." (51, 451)

## Recommendations for Program Revision

The following suggestions are based principally on the data reported in Chapter V and this researcher's experience with the project program. It is recommended that:

(1) an effort be made to increase the cooperative involvement of school personnel in the planning, implementation, supervision, and evaluation of the program. There seems to be both a need for in-service education of the school personnel with regard to the aims and activities of the project and a need for increased awareness of university personnel with regard to the activities of the schools.

(2) the pre-service teachers' exposure to grade level and cultural contrasts occur during different quarters, not concurrently. The combination of a junior high-senior high comparison as well as an inner city-outer city contrast during the pre-student teaching block made it difficult for several project members to sort out the differences in the two schools.

(3) the philosophy of education seminar be more closely related to the other aspects of the project, particularly to the school experiences.

(4) the mathematics and mathematics education departments work cooperatively to develop content sequences designed for prospective secondary teachers as well as jointly

planning and implementing professional experiences for these teachers. Several prospective teachers have indicated a desire for more mathematical content directly related to that taught in the secondary schools; others have mentioned that mathematical content and methods of teaching should be combined.

## Recommendations for Further Research

The following recommendations offer suggestions for further research, but some also have implications for the modification of teacher education programs.

The results of this study severely question the value of the student teaching experience. Carefully controlled studies need to be designed to ascertain the most desirable aspects of student teaching and to test alternative approaches to this experience. The notion of eliminating student teaching should at least be entertained, particularly when considering teacher education as a continuing career process. The three specific suggestions mentioned below could be subjected to testing.

(1) Saturating schools with several student teachers might provide a base for improving the student teaching experience. The benefits of additional mathematics teaching personnel could offset the demands placed upon the public school staff.

(2) Holding student teaching seminars in the schools with cooperative school-university planning and operation might enhance the student teachers' professional involvement in school problems and curriculum development.

(3) Increasing the information used for evaluation by the student teachers might improve their practice teaching experience. For example, teaching two classes of the same subject out of phase could establish for the student teacher a replicative basis for judging a teaching approach. Assigning pairs of student teachers to the same class could provide for peer criticism and support.

The correlational relationships of this study suggest several possible research hypotheses:

(1) Student teachers having higher ACT scores, higher grade point averages, and higher pretest scores on the criterion measures tended to have higher posttest scores on the criterion measures. This seems to suggest that initially selecting "better" participants will result in higher posttest scores on the selected measures, but it would not necessarily alter the pattern of lower posttest scores even for these student teachers.

(2) Several cooperating teacher variables were revealed as possibly relating to more favorable student teacher attitudes. Student teachers with higher posttest scores

on at least one of the criterion measures of the study tended to have cooperating teachers with one or more of the following characteristics: more graduate hours in education, studied mathematics more recently, higher MTI:TP pretest scores, higher MTI:SP scores, and a disciplinarian orientation toward mathematics. Basic research is needed to clarify these potentially useful relationships; the results of such research could have implications for both the selection of cooperating teachers and the placement of student teachers.

This study has focused on several specific attitudinal dimensions of the student teaching experience. Further study is needed on other aspects of the student teaching experience. Positive outcomes not evidenced in this study could have resulted.

A follow-up study on the pre-service teachers of this investigation should be conducted with respect to the major variables considered. Data should be collected, perhaps during the first and third years following graduation, from both those who did not enter teaching and those who did. In addition, a follow-up study should investigate the retention rate and the teaching preferences of project and non-project teachers.

Similar studies should be undertaken at other institutions, particularly those training secondary mathematics teachers, in order to provide a broader base for generalization.

# APPENDICES

# Appendix A

## Mathematics Teaching Inventory:

## Teacher Perceptions (MTI:TP)

page

Instrument . . . . . 153

Subscales . . . . . 158

Answer Sheet . . . . . 159

Key . . . . . 160

Mathematics Teaching Inventory: Teacher Perceptions

The purpose of this inventory is to determine what you feel should occur in the teaching of secondary school mathematics. This is not a test and is not designed to evaluate you. You are to read each statement and decide if you strongly agree (SA), basically agree (A), basically disagree (D), or strongly disagree (SD) based upon what you feel should take place in secondary school mathematics.

If you strongly agree, circle SA on the answer sheet; if you basically agree, circle A; if you basically disagree, circle D; if you strongly disagree, circle SD.

All of the statements must be responded to. Record all answers on the answer sheet provided.

NO MARKS should be made in this text booklet.

1. Many important mathematical ideas may be taught through the use of games and puzzles.

2. The teaching of problem solving is primarily helping the student find a rule or formula which fits the situation.

3. A teacher should often provide the answer when students disagree during a discussion.

4. If a student disagrees with what the teacher says, he should say so.

5. Tests should often include problems for which students must design new ways of looking for solutions.

6. The teacher should usually solve illustrative examples of new types of problems before the students attempt them.

7. Students should often be given reading assignments in their textbook.

8. The textbook is based on mathematical fact and should not be questioned by students.

9. Since few adults usually use any mathematics beyond arithmetic, there is little justification for teaching structural concepts at the junior high school level.

10. Collecting numerical data and formulating related problems should be part of a student's experience in mathematics.

11. Students should be allowed to use crutches, such as multiplication tables or counting on their fingers, in doing their homework.

12. School mathematics should be more a set of abstract ideas than a collection of practical skills.

13. Tests should often require the student to solve problems for which he has been given no standard method of solution.

14. It is important that students memorize textbook definitions of mathematical terms.

15. The student's role is to learn what the teacher tells him.

16. A teacher should be hesitant to state a mathematical conjecture which upon further investigation might prove to be false.

17. The textbook and the teacher's notes should provide about the only sources of mathematical knowledge for class discussion.

18. The teaching strategy used in working with an individual should be different from the strategy that is used in working with the entire class.

19. Teacher questions should require students to think about ideas they have previously studied.

20. Since much of mathematics is accumulative, a student should master a concept before proceeding to the next concept.

21. A difficult mathematics problem can often be solved by considering easier related problems.

22. Sophisticated concepts, such as homomorphism, should be used in teaching junior high school mathematics.

23. Students should often be tested on their understanding of the definitions of mathematical terms.

24. It is essential that students have the opportunity to discuss questions that they have on their tests.

25. Most test questions should be similar to homework problems.

26. A teacher should take class time to explore incorrect answers.

27. Students should be encouraged to use textbook ways of doing problems.

28. The principal aim of mathematics teaching is to develop an understanding of the logical structure of mathematics.

29. A teacher should be willing to admit his mistakes to his students.

30. Mathematics teachers should repeat to their students most of what is in the textbook.

31. Since mathematics is an exact science, students should be discouraged from guessing or estimating answers.

32. Students should be taught how to ask themselves questions about statements in the text.

33. Tests should seldom ask students to relate ideas that they have learned at different times.

34. It is essential that students understand the objective of a lesson before work on the lesson is begun.

35. A teacher should allow student questions to change his planned lesson.

36. Mathematics classes should discuss how mathematicians discover mathematical concepts.

37. A teacher should frequently use real world problems to introduce fundamental mathematical ideas.

38. Students should have an opportunity for experimentation and original thought.

39. Constant drill is a good way for students to master mathematics.

40. A student who attempts to solve a problem on a test by legitimate methods should receive credit even if his answer is incorrect.

41. Providing models of physical phenomena in the world is a basic goal in mathematics.

42. Memorization of rules and formulas is quite important for success in mathematical problem solving.

43. Students should frequently be allowed time in class to talk among themselves about ideas in mathematics.

44. Students should memorize most of the details stated in the text.

45. The investigation of specific examples leads to few mathematical discoveries.

46. A teacher should not encourage students to explore alternative algorithms, such as $\frac{a}{b} + \frac{c}{d} = \frac{a+c}{b+d}$, because it might block their understanding of the correct algorithm.

47. Tests should contain problems which relate mathematics to other subject areas.

48. A teacher should frequently have students explain the meanings of statements, diagrams, and graphs which appear in their texts.

49. The habits of thought acquired through the study of mathematics are more important than the ability to solve computational problems.

50. A teacher should usually introduce new topics by the lecture method.

51. The goal of mathematics instruction should be the direct application of the mathematics to the everyday life of the student.

52. The teacher should provide experiences which help students develop the ability to generalize mathematical concepts.

53. A teacher should avoid presenting topics in more than one way since the students may become confused.

54. Most questions students ask in class should be to clarify statements made by the teacher or the text.

55. The teacher should give students step-by-step procedures for solving mathematical problems.

56. The definition of a mathematical term should precede a discussion of the ideas involved.

## Subscales of the

## Mathematics Teaching Inventory: Teacher Perceptions

**Subscale A: Perceptions of Teacher-Pupil Roles**

8 items: 3, 4, 15, 29, 35, 38, 43, 54

**Subscale B: Use of the Textbook**

9 items: 7, 8, 14, 17, 27, 30, 32, 44, 48

**Subscale C: Design and Use of Tests**

8 items: 5, 13, 23, 24, 25, 33, 40, 47

**Subscale D: Strategies of Teaching Mathematics**

24 items: 1, 2, 6, 10, 11, 16, 18, 19, 20, 21, 26, 31, 34, 36, 37, 39, 42, 45, 46, 50, 52, 53, 55, 56

**Subscale E: Mathematical Orientation**

7 items: 9, 12, 22, 28, 41, 49, 51

Answer Sheet
Mathematics Teaching Inventory

Name_____ School_____ Date_____

If you strongly agree with the statement in the Inventory, circle SA; if you basically agree, circle A; if you basically disagree, circle D; or if you strongly disagree, circle SD.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | SA | A | D | SD | 20. | SA | A | D | SD | 39. | SA | A | D | SD |
| 2. | SA | A | D | SD | 21. | SA | A | D | SD | 40. | SA | A | D | SD |
| 3. | SA | A | D | SD | 22. | SA | A | D | SD | 41. | SA | A | D | SD |
| 4. | SA | A | D | SD | 23. | SA | A | D | SD | 42. | SA | A | D | SD |
| 5. | SA | A | D | SD | 24. | SA | A | D | SD | 43. | SA | A | D | SD |
| 6. | SA | A | D | SD | 25. | SA | A | D | SD | 44. | SA | A | D | SD |
| 7. | SA | A | D | SD | 26. | SA | A | D | SD | 45. | SA | A | D | SD |
| 8. | SA | A | D | SD | 27. | SA | A | D | SD | 46. | SA | A | D | SD |
| 9. | SA | A | D | SD | 28. | SA | A | D | SD | 47. | SA | A | D | SD |
| 10. | SA | A | D | SD | 29. | SA | A | D | SD | 48. | SA | A | D | SD |
| 11. | SA | A | D | SD | 30. | SA | A | D | SD | 49. | SA | A | D | SD |
| 12. | SA | A | D | SD | 31. | SA | A | D | SD | 50. | SA | A | D | SD |
| 13. | SA | A | D | SD | 32. | SA | A | D | SD | 51. | SA | A | D | SD |
| 14. | SA | A | D | SD | 33. | SA | A | D | SD | 52. | SA | A | D | SD |
| 15. | SA | A | D | SD | 34. | SA | A | D | SD | 53. | SA | A | D | SD |
| 16. | SA | A | D | SD | 35. | SA | A | D | SD | 54. | SA | A | D | SD |
| 17. | SA | A | D | SD | 36. | SA | A | D | SD | 55. | SA | A | D | SD |
| 18. | SA | A | D | SD | 37. | SA | A | D | SD | 56. | SA | A | D | SD |
| 19. | SA | A | D | SD | 38. | SA | A | D | SD | | | | | |

## Key for the Mathematics Teaching Inventory:

### Teacher Perceptions

| | | | |
|---|---|---|---|
| 1. SA | 15. SD | 29. SA | 43. SA |
| 2. SD | 16. SD | 30. SD | 44. SD |
| 3. SD | 17. SD | 31. SD | 45. SD |
| 4. SA | 18. SA | 32. SA | 46. SD |
| 5. SA | 19. SA | 33. SD | 47. SA |
| 6. SD | 20. SD | 34. SD | 48. SA |
| 7. SA | 21. SA | 35. SA | *49. SD |
| 8. SD | *22. SD | 36. SA | 50. SD |
| *9. SA | 23. SA | 37. SA | *51. SA |
| 10. SA | 24. SA | 38. SA | 52. SA |
| 11. SA | 25. SA | 39. SD | 53. SD |
| *12. SD | 26. SA | 40. SA | 54. SD |
| 13. SA | 27. SD | *41. SA | 55. SD |
| 14. SD | *28. SD | 42. SD | 56. SD |

28 items keyed SA

28 items keyed SD

*Indicates items belonging to the Mathematical Orientation subscale. These items have been keyed in the utilitarian direction and do not contribute to the composite score.

# Appendix B

## Mathematics Teaching Inventory:

## Student Perceptions (MTI:SP)

Page

Instrument . . . . . 162

Subscales . . . . . 166

Key . . . . . 167

Mathematics Teaching Inventory: Student Perceptions

The purpose of this inventory is to find out how well you know what is going on in your mathematics class. Each statement describes some classroom activity. The activities are not judged as either good or bad. Therefore, this inventory is not a test and is not designed to grade either you or your teacher. You are to read each statement and decide if it describes the activities in your class. All answers should be recorded on the answer sheet. NO MARKS should be made in this booklet.

| SAMPLE QUESTION<br>Inventory | Answer Sheet<br>T | <br>F |
|---|---|---|
| 1. My teacher often takes class attendance | 1. ( ) | ( ) |

If the statement describes what happens in your classroom, blacken the space under the letter T (TRUE) on the answer sheet: if it does not, blacken in the space under the letter F (FALSE).

REMEMBER:

1. The purpose of this inventory is to find out how well you know what is going on in your classroom.
2. Make no marks on this booklet.
3. All statements should be answered on the answer sheet by blackening in the space under the response in pencil.
4. Please do not write your name on this booklet or answer sheet.

1. Our teacher sometimes uses games and puzzles to help us learn our mathematics.

2. We usually solve problems by finding a rule or formula which works.

3. If we disagree during a discussion, our teacher usually tells us who is right.

4. If we don't agree with what our teacher says, he wants us to say so.

5. We often have problems on our tests that make us find new ways of solving them.

6. Our teacher usually does examples of new types of problems before we try them.

7. We often have reading assignments in our textbook.

8. Our teacher does not like us to question what our textbook says.

9. We are sometimes asked to make up our own problems and to collect the numbers for them.

10. Our teacher does not mind if we use multiplication tables or count on our fingers when we do our homework.

11. Our tests often ask us to figure out answers to new problems.

12. We are often asked to memorize definitions the way they are stated in our textbook.

13. Our job is to learn what our teacher tells us.

14. Our teacher hesitates to make a mathematical guess which might prove to be wrong.

15. The textbook and our teacher's notes are about all we use for class discussion.

16. Our teacher asks questions that cause us to think about ideas we have studied before.

17. Our teacher tries to get us to learn an idea completely before we go on to the next idea.

18. We often solve difficult math problems by considering easier problems.

19. We are often tested on our understanding of the definitions of mathematical terms.

20. We always have a chance to discuss in class the questions that are asked on our tests.

21. Most of our test questions are similar to our homework problems.

22. Our teacher frequently takes class time to discuss wrong answers.

23. Our teacher wants us to do problems the way they are done in the textbook.

24. Our teacher is willing to admit when he makes a mistake.

25. Our teacher repeats most of what is in our textbook.

26. Our teacher does not want us to guess or estimate our answers.

27. Our teacher tries to teach us how to ask ourselves questions about statements in the text.

28. Our tests don't usually ask us to relate ideas that we have learned at different times.

29. Our teacher always makes sure we understand what a lesson is going to be about before we begin work on the lesson.

30. Our teacher sometimes changes what he was planning to teach because of our questions.

31. We sometimes discuss how mathematicians discover mathematical ideas.

32. Our teacher frequently uses real world problems when presenting new topics in mathematics.

33. Our teacher allows us to experiment and to do original thinking.

34. We learn our mathematics by constantly doing many problems of the same kind.

35. If we try to solve a problem on a test by a correct method we receive credit even if our answer is wrong.

36. Memorizing rules and formulas is very important in solving math problems correctly.

37. We are frequently allowed time in class to talk among ourselves about ideas in mathematics.

38. We are expected to memorize most of the details in our textbooks.

39. Our tests sometimes ask us to work problems that relate mathematics to other subjects.

40. Our teacher often asks us to explain the meaning of statements, diagrams, and graphs that are in our textbooks.

41. Our teacher usually introduces new topics by lecturing.

42. Much of the mathematics we study applies directly to our everyday lives.

43. Our teacher usually does not teach a topic in more than one way.

44. Most of the questions that we ask in class are to clear up what the teacher or textbook has told us.

45. Our teacher gives us step-by-step ways of solving math problems.

46. We usually define a mathematical term before we discuss it.

Subscales of the

Mathematics Teaching Inventory:

Student Perceptions

Subscale A: Perceptions of Teacher-Pupil Roles

12 items: 3, 4, 13, 16, 22, 24, 29, 30, 33, 37, 41, 43

Subscale B: Use of the Textbook

9 items: 7, 8, 12, 15, 23, 25, 27, 38, 40

Subscale C: Design and Use of Tests

7 items: 5, 11, 19, 20, 28, 35, 39

Subscale D: Strategies of Teaching Mathematics

12 items: 1, 9, 10, 14, 17, 18, 26, 31, 32, 34, 36, 46

Note: Items 2, 6, 21, 42, 44, and 45 were not validated and hence were not keyed or scored, but they were used for anecdotal analysis.

Key for the

Mathematics Teaching Inventory

Student Perceptions

| | | | |
|---|---|---|---|
| 1. True | 13. False | 25. False | 37. True |
| *2. | 14. False | 26. False | 38. False |
| 3. False | 15. False | 27. True | 39. True |
| 4. True | 16. True | 28. False | 40. True |
| 5. True | 17. False | 29. True | 41. False |
| *6. | 18. True | 30. True | *42. |
| 7. True | 19. True | 31. True | 43. False |
| 8. False | 20. True | 32. True | *44. |
| 9. True | *21. | 33. True | *45. |
| 10. True | 22. True | 34. False | 46. False |
| 11. True | 23. False | 35. True | |
| 12. False | 24. True | 36. False | |

23 items keyed true

17 items keyed false

*Indicates items that were not validated, keyed, or scored but used only for anecdotal analysis.

Appendix C

## CULTURAL ATTITUDE INVENTORY*

FORM B

### Directions

Read each statement below and decide how you feel about it. There are no right or wrong answers; your immediate reaction to the statement is desired. If you strongly agree, circle SA on the answer sheet provided; if you agree, circle A; if you are undecided or uncertain, circle U; if you disagree, circle D; and if you strongly disagree, circle SD.

1. Children without clean bodies and clothes should remain in school.
2. A child who uses obscene language should be severely punished.
3. Children who continually defy the teacher need extra help and interest from her.
4. Pupils who come from lower-income homes are quite aggressive. They will need active participation in learning activities.
5. Children who are constant failures need to meet success to become interested in school.
6. Parents of children from lower class homes are not interested in education.
7. Children from lower class homes feel they are not accepted in school.
8. Culturally deprived children dislike school more often than they like it.
9. Children from culturally deprived homes respond to learning experiences with a game format due to their love of action.
10. All teaching techniques used with middle and upper class children are successful with children from the lower class.
11. Frequent opportunities for physical action, such as exercises, active games, and movement about the classroom are necessary for culturally deprived children.

*This instrument was developed by Dorothy J. Skeel, Pennsylvania State University, 1966.

12. Children from deprived areas should share with the teacher the responsibility of establishing rules for the classroom.

13. Children from culturally deprived areas are more difficult to control. Strict discipline should be imposed at all times.

14. A child should not be punished for use of obscene language, but requested not to use it again.

15. The teacher should use the same language and slang as a deprived child to make him feel comfortable.

16. Academic standards should be lowered for deprived children.

17. Children from lower-income homes, if they are capable, should be encouraged to go on to college.

18. An accurate description of a culturally deprived child would be that he is uncontrolled and aggressive.

19. Since children from deprived homes place great emphasis on physical strength and prowess, they need some male teachers.

20. All student teachers should have some experience in schools with culturally deprived children.

21. Parents of children from culturally deprived homes place more emphasis on the usability of education and less on the intellectual stimulation.

22. Teachers should respect culturally deprived children rather than pity or love them.

23. Culturally deprived children deserve the best education as an opportunity to develop their potential.

24. Children from culturally deprived areas should be placed in special classes away from youngsters from middle and higher-class homes to prevent hurt feelings.

25. Parents of culturally deprived children frequently employ physical punishment. Teachers of these children should employ the same type of punishment.

26. The most effective form of punishment for culturally deprived children is the restriction of privileges.

27. Culturally deprived children need more individualization of instruction.

28. Children from deprived homes need socialization experiences, but time in school should not be wasted on these experiences.

29. Culturally deprived children often shout out answers in class, which is their way of bothering the teacher.

30. Teachers should ignore nasty remarks made to them by a child.

31. Children from underprivileged homes have little regard for their own worth; therefore, the teacher will need to develop activities which will help them realize their own worth.

32. Culturally deprived children should not be given special help, but be taught as other children.

33. The values of the culturally deprived are to be ignored and middle class values imposed upon them.

34. The teacher will need to make examples of children caught stealing to show other culturally deprived how wrong it is.

35. The culturally deprived child has a slow way of thinking and lessons will need to be explained carefully in detail without generalizations.

36. Deprived children are lacking in verbal skills, but the teacher should not be expected to spend extra time developing these when other subjects, such as arithmetic and spelling, might be slighted.

37. Children from deprived areas lack motivation to achieve, but it is an impossibility for the teacher to supply this motivation.

38. Teachers should rid themselves of prejudice toward culturally deprived, remembering that they are culturally different.

39. It is difficult to find any strengths in the culture of the deprived.

40. Most teachers fear a teaching appointment in a culturally deprived area.

41. The standard I.Q. tests do not accurately assess the intelligence of the culturally deprived. The results of these tests should not be accepted per se, but the teacher should attempt to discover the hidden I.Q. of a culturally deprived child by other means.

42. It appears that too much time and money are now spent to discover ways of helping culturally deprived children, as compared with the attention accorded gifted children.

43. A teacher of culturally deprived children should not be friendly and informal with the children, for they will take advantage of her.

44. Culturally deprived children are insensitive to the feeling of others.

45. To be prepared to teach the culturally deprived, a person does not need to be wholeheartedly committed to their cause.

46. Teachers of culturally deprived need to show these children that school has a meaningful connection with their lives.

47. A firmly structured and highly regulated classroom is needed for culturally deprived children, to bring some order into their disordered lives.

48. A middle class teacher cannot bridge the gap between her own background and the background of culturally deprived children. She will need to raise the standards of culturally deprived children to her own.

49. A teacher of culturally deprived children should become familiar with the social and economic background of the slums.

50. Culturally deprived children are sexually uninhibited and primitive.

Appendix D

# TEACHING SITUATION REACTION TEST

Revised September, 1966

Directions: The case example that follows has been planned to measure your ability to work through some of the problems of handling a classroom group. You will be given certain information about the classroom group and the working situation. You will then be asked to respond to a number of questions. This will be repeated through a series of problem situations. The case study has been designed so that you can respond regardless of your teaching subject field. You do not need technical subject matter knowledge to take this test.

You are asked to indicate your first, second, third, and fourth choice under each question by inserting respectively the numbers 1, 2, 3, 4, in the spaces provided on the answer sheets under (a) (b) (c) and (d). The most desirable choice should be labeled 1, and the least desirable 4. For example if your first choice was response (c), your second choice was response (a), your third choice was response (b), and your fourth choice was response (d), you would record your responses on the answer sheet as follows:

| (a) | (b) | (c) | (d) |
|---|---|---|---|
| 2 | 3 | 1 | 4 |

Please do not write on the test booklet.

The Situation:

You have been employed by a school system which is engaged in a series of experimental studies. One of these studies involves an experimental class designed to improve pupils' general adjustment to their environment. A heterogeneous group (physically, mentally, socially) of twenty-five thirteen to fourteen year old youngsters have signed up for this class.

The class is scheduled to meet the last period of the day on Tuesday and Thursday during the last half year. Arrangements have been made so that the class might take trips and students might have an opportunity to meet informally with the teacher after class.

Around the first of November your principal calls you in to tell you that, if you are interested, you have been chosen to teach the experimental class. You were asked because of your background in adolescent psychology and your interest in helping youngsters with minor problems of adjustment typical of the young adolescent.

Your principal has given you pretty much of a "free hand" to develop the content of the course and the activities in which the students will be engaged. A good supply of instructional materials, books on the adolescent, and descriptions of similar programs in other schools has been made available to you. There will be no direct supervision of your work, but an evaluation by students and yourself will be requested at the middle and close of the semester. Studies will also be made of the gain in personal adjustment evidenced by your students. You know the names of the students who have signed up for your course. An experienced teacher-counselor has been asked by the principal to help you when and if you ask for help. The teacher-counselor knows well each of the youngsters who have signed up for your class.

The Group:

Some of the youngsters who have signed up for the course know each other very well, having gone through school together. Three do not know anyone else in the group. Others are only casually acquainted. Members of the group have a variety of interests and abilities, and they represent many levels of competence and come from a variety of socio-economic backgrounds. The quality of their personal adjustment varies, but none is seriously maladjusted.

A. You have about eight weeks plus the Christmas vacation to plan for your class:

1. When you begin planning the course you would:

   (a) Ask your teacher-counselor what he thinks should be in the course.

   (b) Examine the materials available to you and determine how they might be used by members of the class.

   (c) Read through the copies of publications describing other school programs of a similar nature and draw ideas from them.

   (d) Interview a randomly selected group of the young people signed up for the course and set your own tentative objectives based on these interviews.

2. During early December an important local civic group comes out against teaching sex education in the schools. Your planning had included some sex education. At this point in your planning you would:

   (a) Continue planning as you have been.

   (b) Ask the principal if you should include any sex education in your course.

   (c) Remove the lessons dealing with sex education.

   (d) Find ways to get the sex education material across without causing an issue.

3. About three weeks before your class is scheduled to meet for the first time, your principal asks you to come in and talk with him about the course. You would hope that your principal would:

   (a) Say that if there was anything that he could do to be of help that you should feel free to call on him.

   (b) Indicate to you what he would hope the course would accomplish during the semester.

   (c) Encourage you to talk about the purposes of your course as you see them after several weeks of planning.

   (d) Make specific suggestions to help you in your planning, and encourage you to drop in for further suggestions if you need help.

4. The weekend before the course is to start it would be natural for you to feel:

   (a) Concern that your planning has been appropriate.

   (b) Anxious to get started and prove your ability to handle this rather difficult assignment.

   (c) Hopeful that the course will prove of real value to the students.

   (d) Confident knowing you have done the best you could under the circumstances.

B. You will have your first meeting with the group tomorrow.

5. It will be important that you have planned for:

   (a) Students to get well acquainted with each other.

   (b) Explaining your grading system.

   (c) Activities to catch student interest.

   (d) Explaining your complete program for the semester.

6. The teacher-counselor drops by your room and asks if he can be of help. You would ask him for:

   (a) His opinion about what you have planned for tomorrow.

   (b) Suggestions to help you make a good impression.

   (c) Suggestions as to what student reaction might be on the first day.

   (d) Nothing until you had an opportunity to meet with the group.

7. The most important personal information to gather at the first meeting would be:

   (a) Interests of the different students.

   (b) Parent or guardian, home address and phone number.

   (c) What the students would like to do in the course.

   (d) Why they are taking the course.

8. Of the things you would do the evening before meeting the class, the most essential would be to:

   (a) Become familiar with the notes for such presentations as you might make.

   (b) Become familiar with students' names and any information you have about them from their files.

   (c) Become familiar with the sequence and nature of any activities you may have planned.

   (d) Be sure any materials you were to use were available and in good condition.

9. Your greatest concern on this night before the first meeting would be:

   (a) How to appear poised and at ease.

   (b) How to gain control of the group.

   (c) How to handle problem pupils.

   (d) How to get your program moving rapidly and well.

C. On meeting the group the first day a number of students come in from three to five minutes late. Following this, as you get your program underway the students get restless.

10. With the students that come in late you would:

   (a) Simply acknowledge their presence and noticeably mark them present in the record book.

   (b) Inform them politely about the time at which the class starts.

   (c) Ask them politely why they were unable to get to class on time.

   (d) Make clear to the class as a whole and the late students in particular the standards you will maintain with regard to tardiness.

11. You would handle the restlessness of the group by:

   (a) Presenting your program more dynamically.

   (b) Asking students why they were restless.

(c) Speaking to the group firmly about paying attention.

(d) Picking out one or two of the worst offenders and reprimanding them.

12. You would tell the group your name and:

(a) The rules of conduct for your class.

(b) Your expectations for the class.

(c) Some of your personal adjustment problems at their age.

(d) Some of your interests and hobbies.

13. You would, by your general behavior and manner, try to present yourself as:

(a) Firm and serious but fair.

(b) Efficient, orderly and business-like.

(c) Friendly, sympathetic and understanding.

(d) Understanding, friendly and firm.

14. You would prepare for the next meeting by:

(a) Discussing with pupils what they would like to do and deciding on one or two ideas.

(b) Telling them what pages to read.

(c) Giving students a choice of two ideas and determining in which the majority is interested.

(d) Discussing your plans for the next meeting with them.

D. You have met with your class four times and have made some observations. Two boys seem particularly dirty and you have found they come from a lower class slum area. One girl seems to be withdrawn. The students do not pay any attention to her. She is a pleasant looking well dressed girl. There are four or five youngsters, apparently very good friends (both boys and girls) who do most of the talking and take most of the initiative. Students seem to continually interrupt each other and you.

15. In the interests of the two boys from the slum area you would:

    (a) Find an opportunity to discuss the matter of cleanliness with the class.

    (b) Speak to the boys about their need to be clean in a conference with them.

    (c) Inaugurate a cleanliness competition with a prize to that half of the class with the best record, putting one boy in each half.

    (d) Speak to the boys about their need to be clean and arrange facilities at school where they could clean up.

16. In the interests of the apparently withdrawn girl you would:

    (a) Talk to her informally over a period of time to see if you could determine her difficulty.

    (b) Call on her regularly for contributions to the discussion.

    (c) Discover a skill she has and have her demonstrate for the class.

    (d) Have a conference with her and tell her to become involved with the class discussion and speak up.

17. To improve the relationship of the group to the apparently withdrawn girl you would:

    (a) Determine who, if anyone, is friendly with her and arrange to have them work together on occasion.

    (b) Take the girl aside and help her see how she can establish better relations with her classmates.

(c) Arrange to have her work with the group of boys and girls who take most of the initiative.

(d) Allow her to work out her own problems.

18. With regard to the four or five youngsters who do most of the talking and take the initiative you would tend to believe:

(a) They are brighter than most of the other students.

(b) They are the leaders of the class.

(c) There is considerable variation in student's ability to participate in class.

(d) They are a little too cocky and think they know more than the others.

19. With regard to the tendency of class members to interrupt while others are talking you would:

(a) Tell the class politely but firmly that interruptions are impolite and should not continue.

(b) Discuss the matter with the class, determining why this happens and what should be done about it.

(c) Organize a system of hand raising and set rules for students' participation in discussion.

(d) Set rules for student participation in discussion and firmly but fairly reprimand each person who breaks the rules.

20. One of the important problems facing you now is to do something which:

(a) Will insure that no one is rejected or disliked.

(b) Will result in everybody's being liked.

(c) Will encourage each person's acceptance of the others.

(d) Will guarantee that no one's feelings get hurt.

E. At the beginning of the eighth class session (fourth week) Johnny comes into class holding on to his arm and very nearly crying. The tears are welled up in his eyes and he looks away from the others. You notice that Peter, the largest and strongest boy in the class, looks at Johnny occassionally with a sneering smile. You do not feel that you can let this pass, so you arrange to meet with Johnny and Peter separately after class.

21. You would tend to believe:

(a) That Johnny probably did something for which this was just, but maybe severe, payment.

(b) That Peter is something of a bully.

(c) That Johnny was hit on the arm by Peter.

(d) That Johnny felt badly and Peter was quite aware of it.

22. When you meet with Johnny you would:

(a) Ask him if Peter hit him and why.

(b) Engage him in conversation and lead slowly into the difficulty he had that afternoon.

(c) Tell him you were aware that he had some difficulty and offer your help to him.

(d) Let him guide the discussion and reveal what he would about the incident.

23. When you meet with Peter you would:

(a) Tell him that Johnny was upset this afternoon and you had noticed that he (Peter) was looking strange -- proceed from there.

(b) Make him aware that you know he had trouble with Johnny and proceed from there.

(c) Make him aware that he is bigger and stronger than the other boys and that he is a bully if he picks on smaller boys.

(d) Ask him if he and Johnny had had difficulty.

24. When young people get into conflict in school it would be best to:

(a) Let them resolve it themselves.

(b) Help them to establish a friendly relationship.

(c) Find the cause of the trouble and work to eliminate it.

(d) Control the school situation so that the conflicts are less likely to arise.

F. In general your program has been moving along satisfactorily. After the eighth meeting you have a feeling that the students are beginning to lose interest. A number of students seem to be sitting through class without really getting involved. Others seem to stay interested and active. The teacher-counselor asks to see you informally over coffee.

25. When you meet with the teacher-counselor you would:

(a) Not talk about your class or its present lack of involvement.

(b) Discuss your concern with him and listen for suggestions he might have.

(c) Speak about how satisfactory the early meetings had been.

(d) Allow the teacher-counselor to orient the discussion.

26. Your planning for the next (ninth) session would include:

(a) Some new ideas that you had not tried.

(b) Some clarification of the importance of students doing well in their work.

(c) A request for ideas from students as to how to make the class more interesting.

(d) Ways to get more students actively doing something in class.

27. During the ninth session you would:

(a) Behave much as you had in earlier sessions.

(b) Put some stress on the importance of <u>everybody</u> paying attention in class.

(c) By careful observation determine which students seem disinterested.

(d) Speak pointedly to those who were not paying attention.

28. You would tend to believe the loss of interest due to:

(a) A rather natural reaction in an elective experimental course.

(b) Failure of students to realize that they must contribute much to a course of this kind.

(c) A rather natural group reaction to the experience of working together on personal adjustment problems.

(d) Your own failure in developing good human relationships in the class and stimulating the students.

G. Before the mid term (eighteenth) meeting of the class you take time out to think about the experiences you have had. The class has been good some days and poor other days. You have had no word from your principal about how your work has been. The teacher-counselor has seemed satisfied but not very much impressed with what you are doing. You have heard nothing about the young people who are being studied. You are asked to meet with the parents to discuss the experimental class in an informal way.

29. You would be most concerned about:

(a) The failure of the principal and teacher-counselor to discuss the progress of the students before your meeting with the parents.

(b) What you should say to the parents.

(c) Your apparent failure to impress your teacher-counselor.

(d) What the studies of the young people are showing.

30. You would resolve to:

(a) Discuss your progress with the teacher-counselor.

(b) Ask for an appointment with the principal to find out how he feels about your work.

(c) Plan to work harder with your group.

(d) Not let the present state of affairs worry you.

31. When talking with the parents you would:

(a) Encourage them to ask questions about the program.

(b) Tell them what the program has consisted of so far.

(c) Tell them you don't know how well the program is going.

(d) Impress upon them the importance of student participation in class activities.

32. In this case you would feel that parents:

(a) Ought to be told how their children are doing in this class.

(b) Ought not to become involved in such an experimental program.

(c) Are entitled to an opportunity to question you.

(d) Ought to be referred to those in charge of the experiment.

33. At your class meeting:

(a) You would tell students what you told their parents.

(b) You would not initiate any discussion about your visit with the parents.

(c) You would discuss briefly the parents' interest in the class.

(d) You would tell the students that you expected more cooperation from them now that their parents were involved.

H. The nineteenth and twentieth class sessions are very unsatisfactory. You leave class at the end of the twentieth session with doubts in your mind as to whether students are gaining in personal and social adjustment. You can see problems with the structure and organization of the class and believe that if these could be corrected or if you had done some things differently over the past few weeks that you would not have a problem with the class.

34. At this point you would:

(a) Decide to go to class the next day and ask your students how they feel about the progress of the course.

(b) Think through the problem carefully and start planning revisions for the course next year.

(c) Try to help yourself accept the fact that life is often filled with disappointments and redouble your efforts to make your class better in the future by spending more time in preparation and encouraging your students to work harder.

(d) Mention your concern at the next meeting of your class and encourage students to talk with you after class about the progress of the course.

35. You would feel much better regarding the accuracy of your estimate about what is wrong with the class if you:

(a) Were sure that some of the students were not being difficult on purpose to test your authority as a new teacher.

(b) Knew more about the expectations of your students and to what extent they felt their expectations were being met.

(c) Could have a colleague in whom you could confide and in whom you could trust, come in and observe your class and talk with you.

(d) Were sure you understood your own needs for success and the extent to which these needs influence your feelings.

36. After the twentieth session, it would be natural for you to feel that:

(a) You would like to relax and think about the situation over the weekend.

(b) You wished students accepted the fact that things that are taught them in schools are usually good for them even though they may not like what they are learning all of the time.

(c) Things seldom go well all the time for everybody and that they couldn't be expected to always go well for you.

(d) It must have been wonderful to teach in the good old days when students were in school because they wanted to learn.

37. In an attempt to analyze the source of the problem you are having with your class you would:

(a) Have a conference with several of the brighter and more interested students to see if they could give you any insight into the problem.

(b) Take part of a class session to share your concerns with the class, get their reactions, and using this information, rethink the problem.

(c) Ask the teacher-counselor to come in and observe the class several times and talk with you about his observations.

(d) Consult the records of the students to see if you could find any clues there.

I. At your twenty-fourth meeting you wish to make plans for a series of visits to different community health and welfare agencies. You want to be sure that the youngsters learn from the experiences and conduct themselves properly while traveling to and from and visiting in the agencies.

38. In order to assure that all youngsters learned from their first trip you would:

(a) Assign particular things for all of them to look for and listen to.

(b) Ask each to write a brief commentary on the most important things they saw and heard.

(c) Encourage them to ask questions while they were there.

(d) Present them with a check sheet of items to be seen and heard and ask them to check off those that they saw or heard.

39. In preparation for the first trip you would:

(a) Tell them as much as you could about the agency to which they were going.

(b) Tell them you were sure it would be interesting and fun and let them see and hear for themselves.

(c) Ask them what they thought they could expect and encourage guided discussions about their expectations.

(d) Tell them about the most interesting things they would see and hear.

40. To insure that the group conducted themselves properly you would:

(a) Set out rules of conduct for them.

(b) Ask them to behave as young ladies and gentlemen representing their school.

(c) Ask them what rules of conduct they would propose and a code with the group.

(d) Assure them that if they did not behave properly they not go on trips in the future.

41. On the trips you would:

(a) Divide them into small groups with a leader responsibl each group and arrange their itinerary and meetings af get to the agency.

(b) Ask the youngsters to get your permission first and on basis allow them to pursue their own interests.

(c) Let the agency people take responsibility for decidin they could go and when.

(d) Keep them all together as a manageable group.

J. At the close of the thirtieth class session, Bob, one of the mos boys, summarizes a class discussion on boy-girl relationships wi we've talked around the subject but we never get down to the imp questions." The agreement of a number of the class members is e

42. You would tend to believe:

(a) The class members are too young to be dealing with imp questions in this area.

(b) You had allowed just a little too much freedom in the of boy-girl relationships.

(c) This simply reflects a natural desire on the part of s to introduce some excitement into the class sessions.

(d) The class could handle important questions in this are your guidance and support.

43. Before the thirty-first session you would:

(a) Clarify the significance and implications of Bob's sta in your own mind.

(b) Determine what you will and will not allow to be discu class in this area.

(c) Consult the principal and get direction from him.

(d) Discuss the situation with the teacher-counselor with a view to getting ideas for handling the next session.

44. During the thirty-first session you would:

(a) Propose a list of carefully selected questions you believe the students have in mind and begin discussions on the most manageable of these.

(b) Repeat Bob's comment and draw from the class a list of what they thought should be discussed.

(c) Suggest that some questions are not appropriate for discussion in school and that some of these fall in the area of boy-girl relationship.

(d) Ask Bob to pick up where he left off and guide him and other class members as they clarify the directions further discussion should take.

K. Your class has at last developed into a fairly cohesive unit. The discussions are more animated and everyone participates to some degree. Disagreements on ideas begin to appear and the students give evidence of intense feelings on a number of issues. George has been particularly outspoken. He has very radical ideas that seem to provoke the other students to disagree but you know that the ideas he expresses have some support from some adolescent psychologists that you consider to be the "lunatic fringe". George seldom gives in on a point.

45. You would believe that these conditions are likely to:

(a) Ultimately strengthen the group.

(b) Do little but make it uncomfortable until George learns his lesson.

(c) Destroy the group unity unless you intervene.

(d) Make it difficult for progress to be made for some students until they learn to accept George.

46. With regard to George you would:

(a) Refer him to the teacher-counselor.

(b) Point out to George that he is intolerant of the views of other class members.

(c) Encourage him to express his ideas in ways that would not irritate other students.

(d) Politely but firmly keep him from expressing such ideas.

47. With regard to the other students you would:

(a) Encourage them in their effort to stand up to George.

(b) Help them to understand what George is doing to them and why.

(c) Help them to get onto topics and ideas where George could not disagree with them so forcefully.

(d) Get into the discussion of their side and show George that he is wrong.

48. With regard to your concern for George as a person, you would feel that:

(a) He is developing undemocratic traits by behaving as he does, and you would hope to help him change.

(b) He does not understand how to behave in a democratic setting and may need help.

(c) He probably has never learned certain social skills necessary for democratic group behavior and the possibilities of developing such skills should be shown him.

(d) He will learn sooner or later that in a democracy some ideas are undesirable because they tend to destroy the group.

## Appendix E

## CONTEMPORARY MATHEMATICS: A TEST FOR TEACHERS

Ronald O. Massie

Directions: Print the information requested in the spaces provided on the answer sheet.

This is not a timed test, but do not waste time trying to answer any one item. If you do not know the answer to an item, make the best guess you can and go on to the next item. There is no penalty for guessing.

Do not write in the test booklet. Use scratch paper to work out your answers, and mark each answer on the answer sheet. Mark only one answer for each item. If you make a mistake or wish to change an answer, be certain that you erase your first answer completely. Do not make other marks on the answer sheet.

Example:

If a and b are natural numbers, under which of the following conditions will a - b always be a natural number?

A) $a < b$

B) $a \neq b$

C) $a > b$

D) $a + b > 0$

E) $ab > 0$

Answer Sheet

| A | B | C | D | E |
|---|---|---|---|---|
| ----- | ----- | [redacted] | ----- | ----- |

# CONTEMPORARY MATHEMATICS: A TEST FOR TEACHERS

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Note: In this test, any numeral other than a base ten numeral will be designated by writing the base name in parentheses to the right of the numeral, as in 2413 (five).

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1. In the binary numeration system, the numeral that represents the number thirty-five is

   A) 100101 (two)
   B) 100110 (two)
   C) 100011 (two)
   D) 101001 (two)
   E) 101010 (two)

2. In the base seven numeration system, the number following 1666 (seven) is represented by the numeral

   A) 1701 (seven)
   B) 2000 (seven)
   C) 1667 (seven)
   D) 1700 (seven)
   E) 1670 (seven)

3. At the right is the table for addition of integers modulo 5. Which integer is the additive inverse of 3?

   A) 0
   B) 1
   C) 2
   D) 3
   E) 4

| + | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| 0 | 0 | 1 | 2 | 3 | 4 |
| 1 | 1 | 2 | 3 | 4 | 0 |
| 2 | 2 | 3 | 4 | 0 | 1 |
| 3 | 3 | 4 | 0 | 1 | 2 |
| 4 | 4 | 0 | 1 | 2 | 3 |

4. The numeral 26 (seven) represents the same number as the numeral

   A) 22 (twelve)
   B) 10010 (two)
   C) 40 (five)
   D) 32 (eight)
   E) 222 (three)

5. In the numeral 3042 (five), interchanging the "2" and the "4" would decrease by ___?___ the value of the number represented by this numeral.

A) 8
B) 13
C) 18
D) 30
E) 33

6. If b is some integer greater than 1, then the maximum number of digits (including a symbol for zero) needed to express any number in the base b numeration system is

A) b + 1
B) b
C) 10 - b
D) 10
E) b - 1

7. The following system is the addition table in a place-value system of numeration. Use this table to find the sum of $\delta\gamma$ and $\gamma$

A) $\beta\alpha\beta\alpha$
B) $\delta\alpha$
C) $\beta\alpha\alpha$
D) $\alpha\alpha$
E) $\beta\gamma\alpha$

| + | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ |
|---|---|---|---|---|
| $\alpha$ | $\alpha$ | $\beta$ | $\gamma$ | $\delta$ |
| $\beta$ | $\beta$ | $\gamma$ | $\delta$ | $\beta\alpha$ |
| $\gamma$ | $\gamma$ | $\delta$ | $\beta\alpha$ | $\beta\beta$ |
| $\delta$ | $\delta$ | $\beta\alpha$ | $\beta\beta$ | $\beta\gamma$ |

8. If a and b are integers under which of the following sets of conditions may we be certain that $\frac{a}{b}$ will always be an integer?

A) $a - b > 0,\ b \neq 0$
B) a and b are not relatively prime, $b \neq 0$
C) $b = 2a,\ b \neq 0$
D) a and b are even integers, $b \neq 0$
E) $a = 2b,\ b \neq 0$

9. Which property of a number field is operating in all of the examples below?

I. $5x + 7x = (5 + 7)x = 12x$ II. $3m + 3n = 3(m + n)$
III. $5 \times 12°8' = 60°40'$ IV. $37 \times 5 = 185$

A) the associative property of multiplication
B) the commutative property of multiplication
C) the distributive property of multiplication over addition
D) the multiplicative identity property
E) the associative property of addition

10. If $x$, $y$, and $z$ are any three rational numbers, which of the following statements is NOT always true?

A) $\frac{x}{z}$ is a rational number, provided $z \neq 0$
B) $zx - zy = xz - yz$
C) $x(y - z) = yx - xz$
D) $x(yz) = (zx)y$
E) There exists a rational number $z$ such that $z = \sqrt{xy}$

11. Which of the following statements best describes the number $\pi$ ?

A) $\pi$ is a rational number but not a real number
B) $\pi$ is a real number but not a rational number
C) $\pi$ is an integer but not a natural number
D) $\pi$ is an irrational number but not a real number
E) $\pi$ is a rational number but not an integer

12. "The goal of instruction in algebra is not exclusively or even primarily the development of manipulative skills. Rather, it is to develop and help students understand the properties of a number field."

If a teacher fully subscribes to the viewpoint expressed above, which of the following topics will likely receive the LEAST emphasis in that teacher's algebra classes?

A) the quadratic formula
B) graphing linear equations
C) factoring
D) logarithmic computations
E) relations and functions

13. Of the following topics, which one is most directly related to mathematical structure?

A) union and intersection of sets
B) truth tables
C) inequalities
D) field axioms of the real number system
E) other number bases

14. Which of the following properties is NOT applicable both to the set of rational numbers and to the set of real numbers?

A) If a, b, and c are in a set S such that $a > b$ and $c > 0$, then $ac > bc$
B) If a and b are in S, then $(a + b)$ is in S
C) Every non-empty subset of S that has an upper bound has a least upper bound in S
D) Between every two members of S there is a third member of S
E) If a is in S and $a \neq 0$, there exists in S a member a' such that $aa' = 1$

15. Let C = {1, 3, 5, 7, 9, 11}. The number of subsets of C is

A) 6
B) 12
C) 36
D) 62
E) 64

16. If X = {a, b, c, d, e, f, g} and Y = {a, c, d}, then the set {b, e, f, g} is called the

A) converse of Y with respect to X
B) range of X with respect to Y
C) complement of Y with respect to X
D) supplement of Y with respect to X
E) inverse of Y with respect to X

17. If A is a set having 7 elements and B is a set having 5 elements, then the number of ordered pairs in the Cartesian product of A and B is

A) 12
B) $5^2 + 7^2$
C) 35
D) $2^7 + 2^5$
E) $7^5$

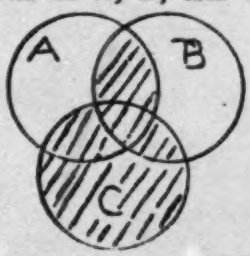
18. If M = {12, 13, 14, 15, 16, 17, 18}, then which of the following statements is <u>not</u> true?

A) $\emptyset \subset M$
B) $16 \in M$
C) $\{16\} \in M$
D) $\{16\} \subset M$
E) $\{13, 15, 18\} \subset M$

19. If X = {x | x is an integer and $-3 < x < 5$} and Y = {y | y is an integer less than 9}, then $X \cap Y$ =

A) {-3, -2, -1, 0, 1, 2, 3, 4, 5}
B) {-2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8}
C) {-3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
D) {5, 6, 7, 8}
E) {-2, -1, 0, 1, 2, 3, 4}

20. If A, B, and C are three sets such that each contains some elements belonging to the other two, then the Venn diagram at the right represents which of the following combinations of A, B, and C?




A) $(A \cup C) \cap (B \cup C)$
B) $(A \cap B) \cup (A \cap C)$
C) $(A \cup B) \cap (A \cup C)$
D) $(A \cap C) \cup (B \cap C)$
E) $(A \cap B) \cap C$

21. Which of the following pairs of sets is disjoint?

A) $\{2, 8, 9, 10\}$ and $\{9, 11, 13, 15\}$
B) $\{x \mid x \text{ is a prime number}\}$ and $\{y \mid y \text{ is an even integer}\}$
C) $\{m \mid m \text{ is a real number and } m^2 < 3\}$ and $\{n \mid n \text{ is an integer and } |n| > 2\}$
D) $\{3, 7, 11, 15, 19\}$ and $\{3, 7, 11, 15\}$
E) $\{a \mid a \text{ is a real number and } a^2 - 4 = 0\}$ and $\{b \mid b \text{ is a natural number and } b \geq 2\}$

22. "If it rains tonight, then we shall stay home" is an example of

A) a syllogism
B) an equivalence
C) a disjunction
D) an implication
E) a tautology

23. Which of the following properties of a postulate set is of such great importance that without it the postulate set is worthless?

A) conciseness
B) consistence
C) independence
D) completeness
E) categoricalness

24. Which of the following statements is true?

A) An implication and its converse are equivalent.
B) An implication and its inverse are equivalent.
C) An implication and its contrapositive are equivalent.
D) The converse and the negation of an implication are equivalent.
E) The inverse and the contrapositive of an implication are equivalent.

25. If p and q represent propositions, which of the following combinations of p and q is equivalent to

not p $\longrightarrow$ not q?

A) not p $\wedge$ q
B) p $\vee$ not q
C) p $\longrightarrow$ not q
D) not p $\vee$ not q
E) not q $\longrightarrow$ not p

26. Which of the following definitions would most likely be found in a geometry textbook written from the viewpoint of modern mathematics?

A) An angle is the set of points that results when two lines are drawn from the same point.
B) An angle is the geometric figure generated by a ray as it moves from some initial position to a terminal position.
C) An angle is the geometric figure determined by rotating a ray about its endpoint.
D) An angle is the union of two non-collinear rays with a common endpoint.
E) An angle is the set of points in the intersection of two distinct half planes.

27. Algebra students are sometimes told that the binomial $x^2 + 2$ cannot be factored. This statement is

A) true because $\sqrt{2}$ is irrational
B) neither true nor false until the field of coefficients has been specified
C) true because $\sqrt{-2}$ is an imaginary number
D) false because $(i\sqrt{2})^2 = -2$
E) false because every quadratic binomial can be written as the product of two first degree binomials.

28. One sometimes sees in algebra textbooks the statement, "If the value of the discriminant of a quadratic equation is a perfect square, the roots of the equation are rational." The value of the discriminant of the equation

$$2x^2 + 2\sqrt{7}x - 1 = 0$$

is 36, yet the roots of this equation are irrational. In order to eliminate discrepancies of this kind it is necessary to specify that

A) the leading coefficient must be 1
B) each coefficient must be an integer
C) each coefficient must be a rational number
D) the coefficient of the middle term must be a rational number
E) the quadratic equation must have real roots

29. The consensus among the major curriculum study groups in mathematics seems to be that deductive reasoning

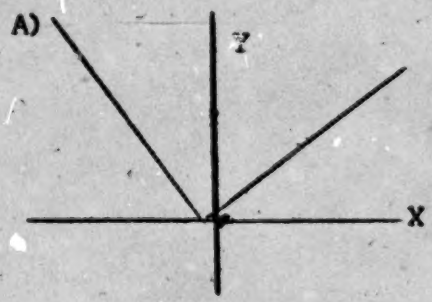
A) is properly confined to geometry in the high school curriculum
B) is vitally important to every student because of the mental discipline it imposes
C) should be taught as a part of a foundations of mathematics course at the 11th grade level
D) needs to be de-emphasized in geometry
E) should be applied in justifying algebraic manipulations

30. The set F = { (1, 3), (2, 5), (3, 8), (5, 7) } is a function whose domain is

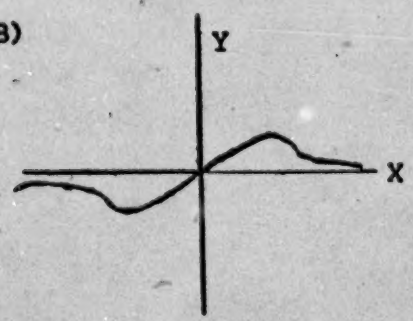
A) { 1, 2, 3, 5, 7, 8 }
B) { 3, 5, 7, 8 }
C) the set of positive integers
D) { 1, 2, 3, 5 }
E) the set of non-negative integers

31. Which of the five graphs below is NOT the graph of a function whose domain is the set of real numbers?

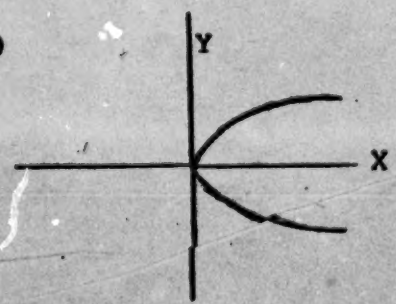
A)



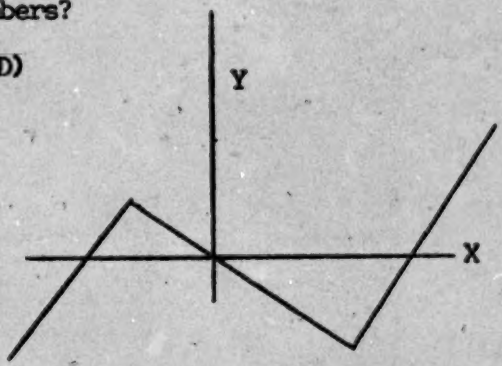

B)



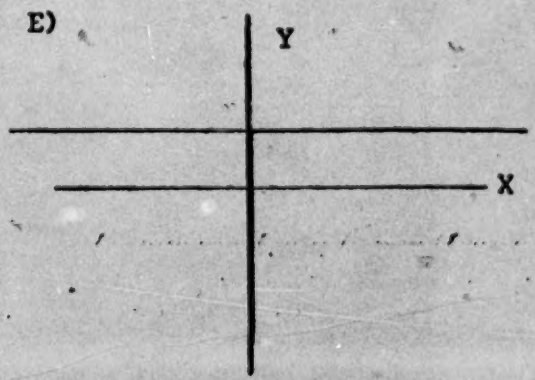

C)




D)




E)

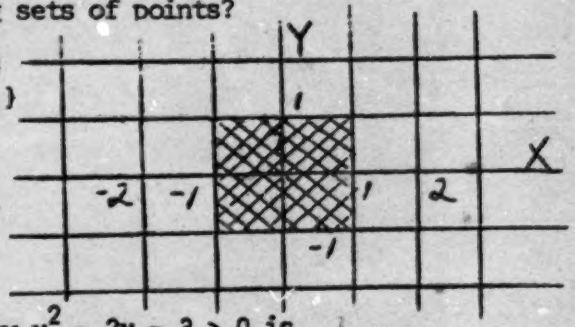


32. Which of the following is a false statement about functions?

A) Some relations are not functions.
B) Every function has a domain and a range.
C) Not every function is a one-to-one mapping.
D) The inverse of a function is not necessarily a function.
E) Some functions are not relations.

33. If x and y are real numbers, the shaded area in the graph below represents which of the following sets of points?

A) $\{(x, y) \mid 0 \leq |x + y| \leq 1\}$
B) $\{(x, y) \mid 0 \leq |x| + |y| \leq 1\}$
C) $\{(x, y) \mid 0 \leq |xy| \leq 1\}$
D) $\{(x, y) \mid 0 \leq |x| \leq 1$ and $0 < |y| \leq 1\}$
E) $\{(x, y) \mid -1 \leq x \leq 1$ or $-1 \leq y \leq 1\}$




34. The solution set of the inequality $x^2 - 2x - 3 > 0$ is

A) $\{x \mid x > 3\} \cup \{x \mid x < -1\}$
B) $\{x \mid x < 3\} \cup \{x \mid x > -1\}$
C) $\{x \mid x > 3\} \cap \{x \mid x > -1\}$
D) $\{x \mid x < 3\} \cup \{x \mid x < -1\}$
E) $\{x \mid x > 3\} \cap \{x \mid x < -1\}$

35. In a high school trigonometry course designed to meet contemporary needs, which one of the topics listed below would likely receive LESS attention than in a traditional trigonometry course?

A) complex numbers
B) logarithmic solution of triangles
C) circular functions
D) vectors
E) the sine and cosine laws

36. Which two of the following linear equations have graphs that are perpendicular?

I. $2x - 3y = 17$
II. $2x + 3y = 17$
III. $-3x - 2y = 17$
IV. $2x - 3y = -17$

A) I and II
B) I and III
C) II and III
D) I and IV
E) II and IV

37. Which of the following statements best explains the trend in recent years to eliminate solid geometry as a separate course in high school?

A) Many mathematics educators feel that students are sufficiently exposed to deductive reasoning in plane geometry.
B) Solid geometry has few practical applications.
C) Most colleges have dropped solid geometry as an entrance requirement.
D) Few teachers are qualified to teach solid geometry because most teacher training institutions have dropped solid geometry as a graduation requirement.
E) It is both possible and desirable to teach many important concepts from solid geometry along with the analogous material in plane geometry.

38. Many of today's geometry textbooks include a unit on coordinate geometry. Which of the following statements is the LEAST valid reason for including this topic in a high school geometry course?

A) The study of coordinate geometry helps the student lay a firm foundation for future study in mathematics.
B) Coordinate geometry relates algebra to geometry and thereby helps to give the student a greater appreciation of the essential unity of all branches of mathematics.
C) Coordinate geometry avoids the defects in Euclidean geometry that resulted from Euclid's lack of an adequate algebra with which to work.
D) Coordinate geometry is an essential part of any contemporary mathematics program because it is relatively new mathematics.
E) Coordinate geometry leads to results that can later be generalized to three and more dimensions.

39. Contemporary applications of the trigonometric functions particularly to periodic phenomena, have led to the need for

A) more sophisticated exercises requiring the solution of surveying and navigational problems.
B) more emphasis on the trigonometric functions of composite angles.
C) greater stress on graphing trigonometric functions.
D) more emphasis on treating the trigonometric functions as functions of the real numbers.
E) greater emphasis on proving trigonometric identities.

40. From a contemporary point of view, classical Euclidean geometry has several defects, among which is a lack of any postulates of order. The current trend among authors of modern high school geometry texts is to

A) base geometry on an entirely new set of postulates so that this difficulty does not arise.
B) ignore this defect since it causes no serious problems in teaching.
C) include in the teacher's manual (but not the text) a discussion of this defect.
D) include an order postulate among the other postulates upon which the course is based without making an issue of its importance.
E) state an order postulate and provide an extensive and detailed discussion of order relations in order to stress the logical subtleties involved.

## Appendix F

### *Checklist for Assessment of Teachers: Supervisor's Perceptions

Directions: Circle the letter of the answer which most accurately indicates your honest and objective evaluation of the behavior of the teacher being rated. Circle only one response under each of the ten questions. Mark all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response is not applicable to the subject being rated. The closest approximation is what is desired. Read all the responses before making a decision.

1. What is the status of the teacher's disciplinary ability?

   a. The teacher makes the students feel free and natural. They are actively interested in and busy with school work. They are able to govern themselves.

   b. The teacher sees to it that work proceeds with little or no interruption. The students are usually attentive to the task at hand.

   c. The teacher is able to restore "order" with an occasional reprimand or warning look. The room is fairly quiet; there is some whispering and inattention. The teacher is usually sensitive to minor lapses of conduct.

   d. The teacher attempts but is unable to control his class. Students in his classroom appear restless. There is considerable inattention and noisy behavior.

   e. The teacher is an authoritarian who "rules with an iron hand." An atmosphere of nervousness and tenseness persists. The classroom is exceptionally quiet. The students do not respect the teacher.

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2. Does the teacher have a "student" or a "subject-matter" point of view?

   a. The teacher is interested in the personality development of the student. He is sensitive to individual differences in students' abilities, interests, and needs. The teacher wants to help students with their personal problems as well as with the subject he is teaching. He tries and often does help students with their problems.

   b. The teacher is sensitive to the various needs of students but does little to meet them. He concentrates on the students' need to learn the subject he is teaching. He varies his standards of achievement for students with different levels of ability.

   c. The teacher is aware of the various needs of the students, but he believes the teacher's responsibility is limited to teaching his subject. The teacher talks about the individual differences of students but does little about such differences.

   d. The teacher is insensitive to any of the needs of students. He is interested only in the subject he is teaching. The teacher sometimes requires the students to do meaningless "busy work."

   e. The teacher ignores students as individuals. He thinks only of subject-matter mastery. Every student must meet the same requirements of achievement. The teacher requires meaningless "busy work" of the student. The students usually do work from the textbook.

3. What is the nature of the teacher's attitude toward adolescents?

   a. The teacher regards the adolescent objectively for what he is. The teacher is friendly and understanding. The teacher likes adolescents and enjoys having them around. He listens to the opinions of adolescents.

   b. The teacher understands that adolescents have potentialities for development, but he does little to help them develop these potentialities. The teacher expresses the desire to know adolescents better.

   c. The teacher often does not try to understand the feelings or opinions of adolescents. He thinks adolescents "just need to grow up." The teacher evaluates adolescents by adult standards rather than by what the adolescents can do.

d. The teacher views the adolescent as a "miniature adult." He tends to expect too much or too little of adolescents.

e. The teacher does not try to understand adolescents. He is not interested in the opinions of adolescents. He is often ill at ease or uncomfortable when adolescents are with him.

4. How does the teacher understand adolescents who have behavior problems?

a. The teacher is not as concerned about adolescents who misbehave in class as he is about adolescents who are "too quiet." He tries to find reasons why adolescents act as they do, and he tries to help them solve their problems.

b. The teacher is aware that adolescents have problems. He looks for reasons why adolescents misbehave. The teacher expects students to behave even if they have problems, and he will punish them if necessary.

c. The teacher usually is not aware that adolescents have reasons for their actions. He knows he should learn something about the background of adolescents, but he often punishes instead.

d. The teacher is not aware that adolescents have problems. He treats all adolescents who misbehave the same way. He always punishes them.

e. The teacher thinks adolescents who are disobedient are the most serious problems. He thinks the shy, quiet adolescents are the "perfect students." He does not try to understand the reasons for the actions of adolescents. He punishes all adolescents who misbehave.

5. What is the attitude of students toward this teacher?

a. Students can talk freely with the teacher. They like him very much.

b. Students respect and admire the teacher, but they feel uncomfortable when talking to him personally.

c. Students generally like the teacher and are willing to do what he wants.

d. Students do not fear the teacher, but they do not respect or like him.

e. Students fear and stay away from the teacher. They might even harm him if they could.

6. Is the teacher capable of analytical thinking?

a. The teacher is intellectually mature. He approaches problems analytically, is capable of theorizing, and enjoys solving problems. His work is carefully planned and detailed. He is persistent and serious.

b. The teacher is generally persistent, serious, and able to analyze and solve more pressing problems. He attempts to organize and plan his work, but he is sometimes lacking in details.

c. The teacher is capable of analytical thinking, but at times he accepts the ideas of others uncritically rather than doing independent thinking. He avoids activities that involve careful planning and detailed work unless he is asked to become involved. He uses habitual procedures.

d. The teacher appears to be casual rather than serious. He is likely to attend to duties as the "spirit moves him." He is willing to "go along with the crowd."

e. The teacher accepts uncritically the ideas of others. He may not be able to think critically. He is willing to avoid planning and thinking. He dislikes intellectual or creative activities.

7. What are the social attitudes of the teacher?

a. The teacher is more interested in people than in things. He converses readily and freely, and makes friends easily. He participates in and enjoys social mixing. He frequently assumes leadership positions.

b. The teacher usually appreciates the opportunity to work with people and seems to enjoy social activities. He appears to be at ease in social groups. He attempts to analyze and improve social relationships.

c. The teacher is quite friendly, but reserved. He will participate in social events only to the extent demanded by his position. He will assume leadership only when asked to do so.

d. The teacher does not like to assume leadership in social functions. He tends to be more interested in things than in people. He dislikes affiliating with social groups.

e. The teacher is self-conscious, shy, and socially timid. He gives evidence of lacking common social skills. He prefers to be alone.

8. What emotional attitudes are shown by the teacher?

a. The teacher's "spirits" are stable and uniform. He is not subject to apprehensive fears or worries and is not easily upset or frustrated. He avoids tension through relaxation. He sees life in reality. He is optimistic.

b. The teacher usually demonstrates good emotional control. He takes things in stride; he settles most minor problems without undue tension or frustration. He appears to be well adjusted and has good physical vigor.

c. The teacher is moody and sometimes emotionally unstable. He frequently appears rushed or disrupted by minor problems. He attempts to be calm in most situations. His poise comes only with considerable effort.

d. The teacher is usually serious and reserved. He is indecisive and uncertain. He often appears distracted as though torn by several demands. He frequently seems embarrassed.

e. The teacher is easily disrupted by minor problems and events. He is readily and easily embarrassed. He often appears tired and listless. His actions appear impulsive and jittery. He frequently feels thwarted and suffers from tension, worry, and uneasiness. He is frustrated and impatient.

9. To what extent does the teacher demonstrate self-confidence?

a. The teacher makes decisions readily. He feels confident of his own judgement and usually makes correct decisions. He easily adjusts to new or different situations. He enjoys the approval and favor of his associates. He is optimistic about the present and future. He is not dissatisfied with his physique or appearance.

b. The teacher is usually equal to varying demands. He does not hesitate to make decisions even though they are not always approved by others. He generally adjusts to new situations without tension.

c. The teacher sometimes feels inferior. He is often pessimistic about the past and the future. He makes decisions but often does not have confidence in his judgements.

d. The teacher avoids new or difficult situations, preferring to follow his habitual routines. He feels sorry for himself much of the time. He makes decisions only after consulting with several friends and associates. He is generally dissatisfied with his personal appearance and ability.

e. The teacher displays the traditional "inferiority feeling." He cannot make decisions satisfactorily or easily. He distrusts his own judgement and ability.

10. To what extend does the teacher develop satisfactory personal relations?

a. The teacher does not lose patience readily and is not angered frequently or easily. He does not feel slighted or misunderstood by others. He is seldom excessively critical of friends and associates.

b. The teacher is conversational and friendly. He has a good sense of humor. He usually has an understanding point of view. He has reasonably good control of his temper.

c. The teacher attempts to work satisfactorily with others when the occasion demands. He is inclined to lose patience when the "chips are down." He tends to be overly critical of friends and associates.

d. The teacher tends to lose patience easily and frequently when working with associates. He displays little effort to work effectively with others.

e. The teacher is easily irritated by others. He is usually touchy and suspicious. He is inconsiderate when working with his associates. He frequently antagonizes others.

## Appendix G

### *Checklist for Assessment of Teachers: Pupil's Perceptions

Directions: Mark the space on the answer sheet which most closely states your honest opinion of the behavior of your teacher or what usually happens in your classroom. Whether your teacher is a man or a woman, your teacher will be referred to as "he" in all of the questions and the responses. Mark only one response under each of the five questions. Make all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response does not apply to your teacher. Please mark the one that most closely describes your teacher or what usually is happening in your classroom. Read all the responses before you choose one.

1. How does your teacher keep his class in order?

   a. Our teacher makes us feel free and natural. We are very interested in and busy with school work. We are able to take care of ourselves.

   b. Our teacher sees to it that work goes on with little or no stopping. We usually pay attention to the work at hand.

   c. Our teacher is able to bring the class back to order with a few warning looks or words. The room is fairly quiet. Some students are whispering and not paying attention. The teacher is usually aware of minor misbehaviors.

   d. Our teacher tries but is unable to control the class. We are restless. We do not pay attention. The classroom is noisy.

   e. Our teacher is strict and rules with an iron hand. Most students are tense and nervous. The classroom is very quiet. Students do not respect our teacher.

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2. Is your teacher more interested in you or in the subject he is teaching?

   a. Our teacher is interested in us as people. He is aware that we can do, are interested in, and need different things. Our teacher wants to help us with our personal problems as well as with the subject he is teaching. He tries and often does help us with our problems.

   b. Our teacher is aware of our different needs but does little to help us with them. He pays attention to our need to learn the subject he is teaching. He expects less of the lower ability students than of the higher ability students.

   c. Our teacher is aware of our different needs but thinks the teacher should teach only his subject. Our teacher talks about our individual differences but does little about the differences.

   d. Our teacher does not pay attention to any of our individual needs. He is interested only in the subject he is teaching. Sometimes we do "busy work" that has little meaning to us.

   e. Our teacher ignores us as individuals. He thinks only of learning the subject. Every student must learn the same things. We do "busy work," and we usually do work from the textbook.

3. How does your teacher feel about students?

   a. Our teacher looks at us the way we really are. He is friendly and understanding. He likes us and enjoys having us around. He listens to our opinion.

   b. Our teacher understands that we are able to learn and grow up but does little to help us. He seems to want to know us better.

   c. Our teacher often does not try to understand our feelings or opinions. He thinks we "just need to grow up." He usually grades us by what adults can do rather than by what we can do.

   d. Our teacher thinks of us as "little adults," not as teenagers. He tends to expect too much or too little of us.

   e. Our teacher does not try to understand us. He is not interested in the opinions of teenagers. He is often ill at ease or uncomfortable when we are with him.

4. How does your teacher understand students who have behavioral problems?

   a. Our teacher is not as worried about students who misbehave in class as he is about students who are "too quiet." He tries to figure out why students do certain things and to help them solve their problems.

   b. Our teacher is aware that students have problems. He looks for reasons why students misbehave. He expects students to behave even if they have problems, and he will punish them if he has to.

   c. Our teacher usually is not aware that students have reasons for doing the things they do. He knows he should learn something about the background of his students, but he often punishes instead.

   d. Our teacher is not aware that students have problems. He treats all students who misbehave the same way. He always punishes them.

   e. Our teacher thinks students who do not obey are the most serious problems. He thinks the shy, quiet students are the "perfect students." He does not try to understand why students act the way they do. He punishes all students who misbehave.

5. What do the students think of your teacher?

   a. Students can talk freely with our teacher. They like our teacher very much.

   b. Students respect and admire our teacher, but they feel uncomfortable when talking to him personally.

   c. Most students like our teacher and are willing to do what he wants.

   d. Students do not fear our teacher, but they do not respect or like him.

   e. Students fear and stay away from our teacher. They might even harm him if they could.

## Appendix H

### Pre-Student Teaching Block Questionnaires

Page

Questionnaire #1 (Project) . . . . . 210

Questionnaire #2 (Project) . . . . . 212

Questionnaire #1 (Project)

Name _____ Age _____ Sex _____
First Middle Last

Campus address _____ Phone _____

Home address _____ Phone _____
street

_____
city state zip code

Major _____ Minor _____

Married? Yes ___ No ___ Car on campus? _____

Transfer student? _____ If so, list previous schools attended:

_____

At what grade level are you interested in teaching? (Circle One)

Elementary K - 6 Junior High 7 - 9 Senior High 10 - 12 Undecided

In what kind of school do you hope to teach? (Circle One)

Urban (Inner City) Intermediate (Urban - Suburban) Suburban (Outer City) Rural

Undecided

What type of student would you prefer to teach? (Circle One)

Slow Average Accelerated Special Undecided

Were you a participant in last year's Junior Project? _____

If so, which quarter(s)? (Circle One)

$J_1$ only $J_2$ only Both $J_1$ and $J_2$

What previous experience have you had in working with young people?

Why did you choose teaching as a profession?

Who or what had the greatest influence on you to enter the field of education?

Why did you select mathematics as your major?

Why is it important that students learn mathematics?

What differences do you expect in working with inner city and outer city schools?

What do you expect to get out of the project this quarter?

Why did you choose this program over the "traditional" program?

Questionnaire #2 (Project)

Name _____ Date _____
First Middle Last

At what grade level are you interested in teaching? (Circle One)

| Elementary K - 6 | Junior High 7 - 9 | Senior High 10 - 12 | College | Undecided |
|---|---|---|---|---|

In what kind of school do you hope to teach? (Circle One)

| Urban (Inner City) | Intermediate (Urban-Suburban) | Suburban (Outer City) | Rural |
|---|---|---|---|

What type of student would you prefer to teach? (Cirlce One)

Slow Average Accelerated Special Undecided

Why is it important that students learn mathematics?

Name the teachers and schools you worked with this quarter and briefly indicate any differences you noticed in facilities, philosophy, administration, teachers, students, etc.

To what do you attribute these differences?

What did you get out of the project this quarter?

In what ways have you changed since you've been in the senior project?

What part of this change do you attribute to the project?

Is your commitment to teaching greater, the same, or less than it was before beginning the project?

Has the project been beneficial to you? In what ways?

What aspects of the program have contributed most your development?

What criticisms do you have of the project?

How can the project be improved?

# Appendix I

## Student Teaching Questionnaires


| | Page |
|---|---|
| Questionnaire #1 (Non-project) . . . . . | 216 |
| Questionnaire #2 (Student Teachers) . . . . . | 218 |
| Cooperating Teacher Questionnaire . . . . . | 221 |

Questionnaire #1 (Non-project)

Name _____ Age _____ Sex _____
First Middle Last

Campus address _____ Phone _____

Home address _____ Phone _____
street

_____
city state zip code

Major _____ Minor _____

Married? Yes _____ No _____ Car on campus? _____

Transfer student? _____ If so, list previous schools attended:

_____

At what grade level are you interested in teaching? (Circle One)

Elementary K - 6 | Junior High 7 - 9 | Senior High 10 - 12 | Undecided

In what kind of school do you hope to teach? (Circle One)

Urban (Inner City) | Intermediate (Urban-Suburban) | Suburban (Outer City) | Rural

Undecided

What type of student would you prefer to teach? (Circle One)

Slow | Average | Accelerated | Special | Undecided

Were you a participant in last year's Junior Project? _____

Is so, which quarter(s)? (Circle One)

$J_1$ only | $J_2$ only | Both $J_1$ and $J_2$

What previous experience have you had in working with young people?

Why did you choose teaching as a profession?

Who or what had the greatest influence on you to enter the field of education?

Why did you select mathematics as your major?

Why is it important that students learn mathematics?

Questionnaire #2 (Student Teachers)

Name _____ Date _____

At what grade level are you interested in teaching? (Circle One)

Elementary K - 6 | Junior High 7 - 9 | Senior High 10 - 12 | College | Undecided

In what kind of school do you hope to teach? (Circle One)

Urban (Inner City) | Intermediate (Urban-Suburban) | Suburban (Outer City) | Rural | Undecided

What type of student would you prefer to teach? (Circle One)

Slow | Average | Accelerated | Special | Undecided

Why is it important that students learn mathematics?

What contribution did the September field experience make to your understanding of the role of the mathematics teacher?

Did you find September field experience worthwhile?

What did you get out of student teaching this quarter?

In what ways have you changed since you began student teaching?

What part of this change do you attribute to the student teaching experience?

Is your commitment to teaching greater, the same, or less than it was before you began student teaching?

Has student teaching been beneficial to you. In what ways?

What aspects of the student teaching quarter have contributed most to to your development?

What criticisms do you have concerning your student teaching experience?

How could the student teaching experience be improved?

Cooperating Teacher Questionnaire

Name _____ Sex: Male ____ Female ____

School _____ Age _____

How many years of teaching experience have you had?

Elementary (K-6) _____ Secondary (7-12) _____

College _____ Total _____

How many student teachers have you had (including this one)? _____

How many years have you taught mathematics? _____

What other subjects are you certified to teach? _____

What other subjects have you taught? _____

How many undergraduate hours of mathematics did you have?

_____ Quarter Hrs. _____ Semester Hrs.

Have you done graduate work in education? _____

If so how much? _____ Quarter Hrs. _____ Semester Hrs.

Have you done graduate work in mathematics? _____

If so how much? _____ Quarter Hrs. _____ Semester Hrs.

In what year did you last study mathematics? _____

Please list any workshops, institutes, inservice-programs, etc. which you have attended.

_____

What is your current teaching assignment?

| Subjects taught | Number of classes of each subject | Modified, Regular or Advanced |
|---|---|---|
| _____ | _____ | _____ |
| _____ | _____ | _____ |
| _____ | _____ | _____ |

Please indicate any extra-curricular assignments you may have._____

## Appendix J

### Percentage of Students in Agreement with The Key for Each Item of the MTI:SP

| Item No. | Key | Classes of the Fall Student Teachers | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 1. | T | 96 | 83 | 80 | 24 | 56 | 69 | 58 | 47 | 42 | 33 | 30 | 20 | 2 | 96 |
| *2. | T | 92 | 96 | 100 | 92 | 88 | 100 | 95 | 98 | 84 | 100 | 86 | 90 | 80 | 96 |
| 3. | F | 31 | 33 | 28 | 40 | 6 | 19 | 11 | 16 | 11 | 19 | 13 | 15 | 48 | 30 |
| 4. | T | 100 | 79 | 96 | 96 | 100 | 94 | 95 | 98 | 95 | 95 | 86 | 95 | 94 | 87 |
| 5. | T | 50 | 42 | 48 | 52 | 75 | 50 | 42 | 49 | 42 | 24 | 52 | 38 | 42 | 37 |
| *6. | T | 88 | 92 | 72 | 76 | 81 | 88 | 84 | 89 | 84 | 86 | 82 | 87 | 96 | 87 |
| 7. | T | 50 | 17 | 100 | 84 | 31 | 19 | 32 | 53 | 37 | 62 | 17 | 18 | 82 | 19 |
| 8. | F | 88 | 88 | 92 | 96 | 88 | 88 | 89 | 87 | 89 | 95 | 86 | 85 | 86 | 96 |
| 9. | T | 81 | 25 | 44 | 12 | 12 | 25 | 21 | 27 | 21 | 10 | 35 | 15 | 12 | 79 |
| 10. | T | 38 | 33 | 84 | 40 | 62 | 69 | 58 | 84 | 63 | 52 | 65 | 67 | 69 | 41 |
| 11. | T | 54 | 33 | 64 | 52 | 69 | 44 | 32 | 56 | 42 | 57 | 39 | 38 | 44 | 35 |
| 12. | F | 77 | 67 | 44 | 76 | 50 | 44 | 37 | 60 | 58 | 52 | 52 | 52 | 88 | 46 |
| 13. | F | 54 | 33 | 28 | 48 | 12 | 25 | 11 | 44 | 16 | 24 | 22 | 35 | 44 | 48 |
| 14. | F | 77 | 42 | 52 | 72 | 62 | 44 | 58 | 42 | 58 | 52 | 56 | 62 | 71 | 61 |
| 15. | F | 81 | 71 | 36 | 40 | 56 | 19 | 47 | 71 | 21 | 33 | 26 | 40 | 19 | 68 |
| 16. | T | 92 | 75 | 92 | 80 | 81 | 89 | 79 | 93 | 79 | 95 | 95 | 85 | 65 | 88 |
| 17. | F | 19 | 29 | 32 | 16 | 25 | 6 | 5 | 4 | 5 | 24 | 30 | 20 | 29 | 19 |
| 18. | T | 96 | 67 | 84 | 92 | 81 | 100 | 74 | 87 | 79 | 67 | 82 | 80 | 92 | 85 |
| 19. | T | 73 | 67 | 84 | 40 | 75 | 38 | 74 | 47 | 42 | 81 | 47 | 55 | 23 | 77 |

Appendix J (Cont.)
Percentage of Students in Agreement with
The Key for Each Item of the MTT:SP

| Item No. | Key | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20. | T | 77 | 83 | 88 | 88 | 94 | 100 | 84 | 100 | 95 | 100 | 91 | 97 | 90 | 94 |
| *21. | T | 96 | 96 | 92 | 92 | 81 | 94 | 100 | 98 | 95 | 95 | 86 | 77 | 92 | 98 |
| 22. | T | 96 | 75 | 88 | 88 | 56 | 88 | 79 | 84 | 63 | 95 | 95 | 85 | 84 | 83 |
| 23. | F | 62 | 67 | 72 | 52 | 25 | 44 | 21 | 78 | 74 | 19 | 22 | 42 | 51 | 44 |
| 24. | T | 96 | 100 | 100 | 100 | 81 | 94 | 100 | 91 | 89 | 100 | 91 | 97 | 92 | 98 |
| 25. | F | 54 | 46 | 20 | 28 | 19 | 12 | 32 | 24 | 32 | 19 | 26 | 10 | 13 | 35 |
| 26. | F | 19 | 42 | 48 | 32 | 38 | 44 | 37 | 22 | 53 | 24 | 39 | 32 | 34 | 28 |
| 27. | T | 65 | 38 | 60 | 36 | 56 | 69 | 58 | 60 | 74 | 71 | 56 | 77 | 42 | 92 |
| 28. | F | 81 | 79 | 72 | 64 | 31 | 56 | 47 | 78 | 68 | 90 | 82 | 75 | 63 | 59 |
| 29. | T | 77 | 62 | 44 | 80 | 88 | 94 | 89 | 73 | 95 | 76 | 69 | 70 | 63 | 79 |
| 30. | T | 81 | 71 | 84 | 76 | 56 | 44 | 47 | 93 | 63 | 43 | 52 | 65 | 67 | 81 |
| 31. | T | 12 | 42 | 52 | 40 | 31 | 25 | 37 | 22 | 63 | 38 | 22 | 25 | 8 | 41 |
| 32. | T | 46 | 54 | 16 | 20 | 56 | 38 | 63 | 22 | 47 | 14 | 30 | 32 | 19 | 62 |
| 33. | T | 85 | 67 | 72 | 80 | 62 | 62 | 74 | 82 | 74 | 86 | 60 | 72 | 55 | 88 |
| 34. | F | 42 | 54 | 64 | 32 | 25 | 31 | 47 | 53 | 16 | 33 | 22 | 25 | 33 | 37 |
| 35. | T | 23 | 12 | 48 | 24 | 31 | 19 | 74 | 96 | 47 | 57 | 73 | 57 | 25 | 85 |
| 36. | F | 23 | 12 | 16 | 12 | 19 | 0 | 5 | 22 | 21 | 5 | 22 | 12 | 40 | 20 |
| 37. | T | 81 | 38 | 48 | 16 | 56 | 50 | 32 | 29 | 53 | 33 | 9 | 38 | 50 | 33 |
| 38. | F | 96 | 83 | 84 | 92 | 62 | 69 | 26 | 89 | 79 | 38 | 65 | 75 | 84 | 83 |
| 39. | T | 54 | 58 | 8 | 36 | 69 | 31 | 68 | 9 | 26 | 24 | 47 | 28 | 48 | 59 |
| 40. | T | 62 | 62 | 68 | 72 | 38 | 62 | 63 | 73 | 47 | 76 | 60 | 75 | 25 | 66 |

Appendix J (Cont.)
Percentage of Students in Agreement with
The Key for Each Item of the MTI:SP

| Item No. | Key | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41. | F | 77 | 67 | 20 | 56 | 50 | 81 | 42 | 53 | 53 | 43 | 69 | 52 | 35 | 59 |
| *42. | F | 62 | 42 | 96 | 72 | 19 | 25 | 32 | 91 | 37 | 71 | 60 | 72 | 86 | 44 |
| 43. | F | 69 | 58 | 60 | 76 | 50 | 50 | 63 | 60 | 63 | 48 | 26 | 62 | 46 | 51 |
| *44. | T | 96 | 71 | 100 | 96 | 81 | 88 | 79 | 80 | 84 | 90 | 73 | 85 | 96 | 81 |
| *45. | T | 96 | 75 | 80 | 96 | 88 | 100 | 79 | 69 | 95 | 90 | 91 | 85 | 84 | 94 |
| 46. | F | 8 | 38 | 4 | 28 | 31 | 19 | 16 | 4 | 21 | 0 | 4 | 10 | 40 | 7 |

*These items were not validated or keyed; the T or F indicates the direction of the listed percentages.

## Appendix K

### Percentages of Agreement with the Key on Parallel Items of the MTI:SP and the MTI:TP

| MTI:SP Percentages for Students | | | | | | MTI:TP Percentages for Teachers | | |
|---|---|---|---|---|---|---|---|---|
| | of Student Teacher | | | of Cooperating Teacher | | | | |
| Item # | Fall | Winter | Spring | Winter | Spring | Item # | Student Teacher | Cooperating Teacher |
| 1. | 51% | 47% | 44% | 36% | 37% | 1. | 96% | 90% |
| 3. | 25% | 19% | 23% | 22% | 19% | 3. | 68% | 55% |
| 4. | 93% | 86% | 84% | 90% | 86% | 4. | 94% | 95% |
| 5. | 44% | 46% | 42% | 42% | 40% | 5. | 73% | 56% |
| 7. | 46% | 36% | 37% | 45% | 41% | 7. | 56% | 71% |
| 8. | 89% | 80% | 78% | 87% | 84% | 8. | 99% | 98% |
| 9. | 33% | 30% | 25% | 24% | 20% | 10. | 96% | 97% |
| 10. | 60% | 54% | 55% | 48% | 56% | 11. | 56% | 58% |
| 11. | 46% | 46% | 46% | 43% | 44% | 13. | 54% | 34% |
| 12. | 59% | 52% | 59% | 53% | 59% | 14. | 72% | 73% |
| 13. | 36% | 24% | 29% | 22% | 25% | 15. | 75% | 74% |
| 14. | 59% | 52% | 55% | 53% | 53% | 16. | 92% | 77% |
| 15. | 47% | 42% | 41% | 39% | 41% | 17. | 97% | 87% |
| 16. | 84% | 82% | 79% | 90% | 86% | 19. | 99% | 92% |
| 17. | 19% | 19% | 27% | 12% | 16% | 20. | 32% | 24% |
| 18. | 84% | 76% | 75% | 76% | 80% | 21. | 99% | 100% |
| 19. | 57% | 61% | 49% | 61% | 47% | 23. | 68% | 75% |

Appendix K (Cont.)
Percentages of Agreement with the Key
on Parallel Items of the MTI:SP
and the MTI:TP

| MTI:SP Percentages for Students | | | | | | MTI:TP Percentages for Teachers | | |
|---|---|---|---|---|---|---|---|---|
| | of Student Teacher | | | of Cooperating Teacher | | | | |
| Item # | Fall | Winter | Spring | Winter | Spring | Item # | Student Teacher | Cooperating Teacher |
| 20. | 92% | 84% | 80% | 87% | 86% | 24. | 100% | 98% |
| 22. | 84% | 69% | 67% | 72% | 70% | 26. | 96% | 90% |
| 23. | 48% | 47% | 49% | 49% | 49% | 27. | 44% | 36% |
| 24. | 95% | 89% | 84% | 92% | 88% | 29. | 100% | 100% |
| 25. | 26% | 30% | 34% | 24% | 27% | 30. | 69% | 50% |
| 26. | 33% | 36% | 43% | 31% | 34% | 31. | 99% | 92% |
| 27. | 62% | 62% | 58% | 65% | 63% | 32. | 97% | 97% |
| 28. | 68% | 57% | 55% | 59% | 59% | 33. | 92% | 95% |
| 30. | 70% | 63% | 60% | 55% | 55% | 35. | 93% | 95% |
| 31. | 30% | 38% | 44% | 43% | 41% | 36. | 75% | 69% |
| 32. | 36% | 43% | 47% | 41% | 44% | 37. | 99% | 95% |
| 33. | 74% | 63% | 63% | 66% | 63% | 38. | 100% | 97% |
| 34. | 37% | 30% | 35% | 32% | 30% | 39. | 52% | 50% |
| 35. | 52% | 59% | 57% | 43% | 41% | 40. | 97% | 76% |
| 36. | 19% | 17% | 25% | 14% | 17% | 42. | 62% | 53% |
| 37. | 39% | 38% | 42% | 31% | 37% | 43. | 79% | 69% |
| 38. | 77% | 63% | 66% | 63% | 66% | 44. | 94% | 94% |
| 39. | 40% | 52% | 47% | 44% | 43% | 47. | 87% | 86% |
| 40. | 60% | 64% | 58% | 66% | 62% | 48. | 93% | 95% |

Appendix K (Cont.)
Percentages of Agreement with the Key
on Parallel Items of the MTI:SP
and the MTI:TP

| MTI:SP Percentages for Students | | | | | | MTI:TP Percentages for Teachers | | |
|---|---|---|---|---|---|---|---|---|
| | of Student Teacher | | | of Cooperating Teacher | | | | |
| Item # | Fall | Winter | Spring | Winter | Spring | Item # | Student Teacher | Cooperating Teacher |
| 41. | 53% | 50% | 43% | 49% | 46% | 50. | 69% | 61% |
| 43. | 56% | 51% | 50% | 57% | 52% | 53. | 93% | 94% |
| 46. | 16% | 18% | 25% | 18% | 22% | 56. | 59% | 47% |

## Appendix L

### Correlation Matrix of the Criterion Variables with the Pre-Student Teaching Block Variables

| Var. No. | Criterion Variables 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 32 | 38 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -.123 (52) | .045 (52) | -.123 (52) | -.065 (52) | -.020 (52) | .219 (52) | .125 (52) | .311 (52) | -.149 (52) | .070 (52) |
| 2 | .098 (52) | -.033 (52) | .071 (52) | -.001 (52) | .086 (52) | -.066 (52) | .029 (52) | .082 (52) | -.020 (52) | .075 (52) |
| 3 | .382 (52) | .140 (52) | .460 (52) | .212 (52) | .054 (52) | -.053 (52) | .093 (52) | .175 (52) | .188 (52) | .073 (52) |
| 4 | -.024 (30) | .035 (30) | .081 (30) | .202 (30) | -.147 (30) | -.150 (30) | .257 (30) | .395 (30) | .106 (30) | .122 (30) |
| 5 | .007 (29) | .005 (29) | .190 (29) | .230 (29) | -.217 (29) | -.214 (29) | .162 (29) | .350 (29) | .174 (29) | .141 (29) |
| 6 | -.189 (29) | -.333 (29) | .010 (29) | -.178 (29) | -.384 (29) | -.323 (29) | .045 (29) | .088 (29) | -.047 (29) | -.253 (29) |
| 7 | -.007 (29) | .146 (29) | .045 (29) | .253 (29) | -.068 (29) | -.028 (29) | .220 (29) | .462 (29) | .102 (29) | .208 (29) |
| 8 | -.020 (29) | .081 (29) | .000 (29) | .224 (29) | -.026 (29) | -.135 (29) | .270 (29) | .312 (29) | .053 (29) | .139 (29) |
| 9 | .032 (52) | -.047 (52) | .035 (52) | -.014 (52) | .056 (52) | -.061 (52) | .212 (52) | .100 (52) | .012 (52) | .026 (52) |
| 10 | .234 (52) | .296 (52) | .103 (52) | .226 (52) | .273 (52) | .257 (52) | -.025 (52) | -.002 (52) | -.028 (52) | .067 (52) |
| 11 | .389 (49) | .042 (49) | .396 (49) | .149 (49) | .209 (49) | -.119 (49) | -.033 (49) | .067 (49) | .125 (49) | .160 (49) |
| 12 | .127 (48) | .033 (48) | .099 (48) | .078 (48) | .104 (48) | -.058 (48) | .212 (48) | .094 (48) | .132 (48) | .175 (48) |
| 13 | .138 (50) | .168 (50) | .100 (50) | .180 (50) | .132 (50) | .045 (50) | .127 (50) | .223 (50) | .226 (50) | .279 (50) |

Appendix L (Cont.)
Correlation Matrix of the Criterion Variables
with the Pre-Student Teaching Block Variables

| Var. No. | Criterion Variables 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 32 | 38 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | .237 (52) | .168 (52) | .227 (52) | .212 (52) | .113 (52) | -.024 (52) | .272 (52) | .216 (52) | .181 (52) | .304 (52) |
| 15 | -.128 (52) | .000 (52) | -.212 (52) | -.055 (52) | .067 (52) | .108 (52) | .103 (52) | .040 (52) | .021 (52) | .001 (52) |
| 16 | 1.000 (52) | .701 (52) | .867 (52) | .687 (52) | .717 (52) | .395 (52) | .105 (52) | .205 (52) | .399 (52) | .471 (52) |
| 17 | .701 (52) | 1.000 (52) | .510 (52) | .862 (52) | .655 (52) | .717 (52) | .120 (52) | .228 (52) | .197 (52) | .508 (52) |
| 18 | .867 (52) | .510 (52) | 1.000 (52) | .667 (52) | .288 (52) | .060 (52) | .158 (52) | .333 (52) | .407 (52) | .451 (52) |
| 19 | .687 (52) | .862 (52) | .667 (52) | 1.000 (52) | .419 (52) | .282 (52) | .145 (52) | .296 (52) | .218 (52) | .488 (52) |
| 20 | .717 (52) | .655 (52) | .288 (52) | .419 (52) | 1.000 (52) | .689 (52) | -.026 (52) | -.069 (52) | .186 (52) | .250 (52) |
| 21 | .395 (52) | .717 (52) | .060 (52) | .282 (52) | .689 (52) | 1.000 (52) | .043 (52) | .038 (52) | .081 (52) | .286 (52) |
| 22 | .105 (52) | .120 (52) | .158 (52) | .145 (52) | -.026 (52) | .043 (52) | 1.000 (52) | .559 (52) | .359 (52) | .396 (52) |
| 23 | .205 (52) | .228 (52) | .333 (52) | .296 (52) | -.069 (52) | .038 (52) | .559 (52) | 1.000 (52) | .228 (52) | .558 (52) |
| 24 | .021 (42) | .068 (42) | -.095 (42) | .001 (42) | .163 (42) | .174 (42) | -.030 (42) | .055 (42) | -.012 (42) | .039 (42) |
| 25 | .142 (45) | -.018 (45) | .000 (45) | -.124 (45) | .237 (45) | .070 (45) | -.078 (45) | -.142 (45) | .039 (45) | .027 (45) |
| 26 | -.483 (36) | -.440 (36) | -.600 (36) | -.539 (36) | -.073 (36) | -.096 (36) | .217 (36) | .017 (36) | -.057 (36) | -.108 (36) |
| 27 | -.185 (49) | -.227 (49) | -.412 (49) | -.442 (49) | .160 (49) | .069 (49) | -.100 (49) | -.281 (49) | .022 (49) | -.121 (49) |

Appendix L (Cont.)
Correlation Matrix of the Criterion Variables
with the Pre-Student Teaching Block Variables

| Var. No. | Criterion Variables 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 32 | 38 |
|---|---|---|---|---|---|---|---|---|---|---|
| 28 | .188 (38) | -.038 (38) | .168 (38) | -.043 (38) | .086 (38) | -.022 (38) | .220 (38) | .155 (38) | .424 (38) | .266 (38) |
| 29 | .297 (35) | .045 (35) | .181 (35) | .090 (35) | .257 (35) | -.093 (35) | .045 (35) | -.065 (35) | .075 (35) | .180 (35) |
| 30 | .185 (52) | .089 (52) | .215 (52) | .073 (52) | .059 (52) | .061 (52) | .219 (52) | .401 (52) | .219 (52) | .272 (52) |
| 31 | .106 (52) | .059 (52) | .037 (52) | -.005 (52) | .184 (52) | -.062 (52) | -.058 (52) | -.021 (52) | .122 (52) | -.055 (52) |
| 32 | .399 (52) | .197 (52) | .407 (52) | .218 (52) | .186 (52) | .081 (52) | .359 (52) | .228 (52) | 1.000 (52) | .614 (52) |
| 33 | .253 (52) | .113 (52) | .329 (52) | .188 (52) | -.005 (52) | 0.026 (52) | .408 (52) | .421 (52) | .664 (52) | .558 (52) |
| 34 | .163 (52) | .044 (52) | .189 (52) | .055 (52) | .043 (52) | .005 (52) | .122 (52) | -.048 (52) | .726 (52) | .330 (52) |
| 35 | .318 (52) | .341 (52) | .173 (52) | .260 (52) | .364 (52) | .319 (52) | .034 (52) | .195 (52) | .510 (52) | .485 (52) |
| 36 | .358 (52) | .116 (52) | .387 (52) | .146 (52) | .149 (52) | .012 (52) | .349 (52) | .110 (52) | .896 (52) | .443 (52) |
| 37 | -.408 (52) | -.240 (52) | -.318 (52) | -.239 (52) | -.326 (52) | -.154 (52) | -.083 (52) | -.066 (52) | -.256 (52) | -.047 (52) |
| 38 | .471 (52) | .508 (52) | .451 (52) | .488 (52) | .250 (52) | .286 (52) | .396 (52) | .558 (52) | .614 (52) | 1.000 (52) |
| 39 | .382 (52) | .208 (52) | .419 (52) | .328 (52) | .122 (52) | -.046 (52) | .279 (52) | .381 (52) | .467 (52) | .675 (52) |
| 40 | .317 (52) | .271 (52) | .327 (52) | .320 (52) | .129 (52) | .073 (52) | .257 (52) | .373 (52) | .446 (52) | .697 (52) |
| 41 | .155 (52) | .394 (52) | -.056 (52) | .212 (52) | .393 (52) | .481 (52) | -.115 (52) | .055 (52) | .046 (52) | .362 (52) |

Appendix L (Cont.)
Correlation Matrix of the Criterion Variables
with the Pre-Student Teaching Block Variables

| Var. No. | Criterion Variables | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 32 | 38 |
| 42 | .362 (52) | .404 (52) | .413 (52) | .385 (52) | .094 (52) | .209 (52) | .449 (52) | .527 (52) | .550 (52) | .807 (52) |
| 43 | -.256 (52) | -.255 (52) | -.174 (52) | -.163 (52) | -.246 (52) | -.231 (52) | -.194 (52) | -.138 (52) | -.281 (52) | -.237 (52) |

Appendix H

Fold-Out Listing of Project Pre-Service Teacher Variables Used in Correlational Analyses for the Pre-Student Teaching Block

Variable Number

1. Quarter (Autumn 1970, Winter 1971)
2. Sex (Male, Female)
3. Age
4. ACT percentiles (composite)
5. ACT percentiles (English)
6. ACT percentiles (mathematics)
7. ACT percentiles (social studies)
8. ACT percentiles (natural science)
9. Knowledge of modern mathematics score (Massie's Test)
10. Commitment to teaching (less, same, greater)
11. GPA (upon entering education)
12. GPA (upon entering student teaching)
13. GPA in Math (calculus courses)
14. GPA in Pre-Student Teaching Block
*15. Participation in the junior project
*16. CAI composite score (pretest)
*17. CAI composite score (posttest)
*18. CAI attitude subscale (pretest)
*19. CAI attitude subscale (posttest)
*20. CAI knowledge subscale (pretest)
*21. CAI knowledge subscale (posttest)
*22. TSRT score (pretest)
*23. TSRT score (posttest)
24. Grade Level Preferences (pretest) (elementary, junior high, senior high, college)
25. Grade Level Preferences (posttest) (elementary, junior high, senior high, college)
26. Kind of School Preferences (pretest) (urban, intermediate, suburban, rural)
27. Kind of School Preferences (posttest) (urban, intermediate, suburban, rural)
28. Type of Student Preferences (pretest) (special, slow, average, accelerated)
29. Type of Student Preferences (posttest) (special, slow, average, accelerated)
30. Marital Status (single, married)
31. Transfer Student (no, yes)

Mathematics Teaching Inventory: Teacher Perceptions (pretest scores)

*32. Composite Score
33. Perceptions of Teacher-Pupil Roles Subscale
34. Use of Textbook subscale
35. Design and Use of Tests subscale
36. Strategies of Teaching Mathematics subscale
37. Mathematical Orientation subscale

Mathematics Teaching Inventory: Teacher Perceptions (posttest scores)

*38. Composite Score
39. Perceptions of Teacher-Pupil Roles subscale
40. Use of Textbook subscale
41. Design and Use of Tests subscale
42. Strategies of Teaching Mathematics subscale
43. Mathematical Orientation subscale

*Denotes criterion variables

## Appendix N

### Correlation Matrix of the Criterion Variables and Other Selected Variables with the Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.000 (71) | -.158 (71) | .013 (71) | .231 (71) | .091 (71) | .221 (71) | .079 (71) | .177 (71) | .119 (71) | .195 (71) |
| 2 | -.158 (71) | 1.000 (71) | -.118 (71) | .028 (71) | -.074 (71) | .050 (71) | -.110 (71) | .038 (71) | -.037 (71) | .041 (71) |
| 3 | .013 (71) | -.118 (71) | 1.000 (71) | .101 (71) | -.064 (71) | .043 (71) | .108 (71) | .185 (71) | .171 (71) | .255 (71) |
| 4 | .231 (71) | .028 (71) | .101 (71) | 1.000 (71) | .224 (71) | .106 (71) | .135 (71) | .139 (71) | .037 (71) | .122 (71) |
| 5 | .239 (46) | -.108 (46) | -.209 (46) | -.153 (46) | .378 (46) | -.042 (46) | -.033 (46) | .098 (46) | .090 (46) | .145 (46) |
| 6 | .222 (43) | .220 (43) | -.245 (43) | -.164 (43) | .196 (43) | -.051 (43) | -.067 (43) | -.002 (43) | .163 (43) | .120 (43) |
| 7 | .244 (43) | -.236 (43) | -.174 (43) | -.185 (43) | .334 (43) | -.028 (43) | -.266 (43) | -.237 (43) | -.127 (43) | -.171 (43) |
| 8 | .055 (43) | -.065 (43) | -.101 (43) | -.171 (43) | .207 (43) | .024 (43) | .071 (43) | .256 (43) | .122 (43) | .303 (43) |
| 9 | .154 (43) | -.493 (43) | -.154 (43) | -.014 (43) | .428 (43) | -.018 (43) | .075 (43) | .202 (43) | .143 (43) | .231 (43) |
| 10 | .091 (71) | -.174 (71) | -.061 (71) | .022 (71) | 1.000 (71) | -.048 (71) | -.044 (71) | .079 (71) | -.082 (71) | .034 (71) |
| 11 | -.163 (71) | .298 (71) | -.200 (71) | .111 (71) | .057 (71) | .018 (71) | -.062 (71) | .127 (71) | .001 (71) | .161 (71) |
| 12 | -.108 (71) | .294 (71) | -.161 (71) | .047 (71) | .075 (71) | -.001 (71) | -.111 (71) | .144 (71) | .021 (71) | .211 (71) |
| 13 | -.204 (71) | .267 (71) | -.219 (71) | .168 (71) | .031 (71) | .037 (71) | -.003 (71) | .095 (71) | -.020 (71) | .088 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14 | .020 (70) | -.067 (70) | -.094 (70) | -.171 (70) | .051 (70) | .020 (70) | .022 (70) | .046 (70) | .097 (70) | .084 (70) |
| 15 | .221 (71) | .050 (71) | .043 (71) | .106 (71) | -.048 (71) | 1.000 (71) | .137 (71) | .384 (71) | .006 (71) | .282 (71) |
| 16 | .081 (66) | .165 (66) | .071 (66) | -.086 (66) | .398 (66) | .137 (66) | -.028 (66) | .214 (66) | .074 (66) | .231 (66) |
| 17 | -.077 (68) | -.021 (68) | .110 (68) | .029 (68) | .488 (68) | .059 (68) | -.058 (68) | .099 (68) | -.022 (68) | .119 (68) |
| 18 | -.038 (69) | -.098 (69) | -.020 (69) | .138 (69) | .499 (69) | .188 (69) | .052 (69) | .188 (69) | .071 (69) | .163 (69) |
| 19 | -.162 (48) | .176 (48) | .087 (48) | .000 (48) | .308 (48) | -.100 (48) | .115 (48) | .080 (48) | .186 (48) | .126 (48) |
| 20 | .041 (71) | -.049 (71) | -.130 (71) | .496 (71) | .370 (71) | .026 (71) | .092 (71) | .210 (71) | -.010 (71) | .081 (71) |
| 21 | .079 (71) | 0.110 (71) | .108 (71) | .135 (71) | -.044 (71) | .137 (71) | 1.000 (71) | .611 (71) | .848 (71) | .500 (71) |
| 22 | .177 (71) | .038 (71) | .185 (71) | .139 (71) | -.082 (71) | .384 (71) | .611 (71) | 1.000 (71) | .570 (71) | .898 (71) |
| 23 | .119 (71) | -.037 (71) | .171 (71) | .037 (71) | -.082 (71) | .006 (71) | .848 (71) | .570 (71) | 1.000 (71) | .627 (71) |
| 24 | .195 (71) | .041 (71) | .255 (71) | .122 (71) | .034 (71) | .282 (71) | .500 (71) | .898 (71) | .627 (71) | 1.000 (71) |
| 25 | .043 (71) | -.157 (71) | -.052 (71) | .189 (71) | .026 (71) | .264 (71) | .689 (71) | .352 (71) | .221 (71) | .062 (71) |
| 26 | .105 (71) | .015 (71) | -.013 (71) | .125 (71) | .109 (71) | .393 (71) | .515 (71) | .720 (71) | .255 (71) | .357 (71) |
| 27 | -.001 (71) | .029 (71) | .081 (71) | .023 (71) | .032 (71) | .050 (71) | .221 (71) | .294 (71) | .304 (71) | .369 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 28 | .020 (71) | .057 (71) | .218 (71) | -.089 (71) | .059 (71) | .139 (71) | .226 (71) | .385 (71) | .298 (71) | .415 (71) |
| 29 | -.083 (61) | -.427 (61) | .164 (61) | -.090 (61) | .145 (61) | -.058 (61) | -.021 (61) | -.053 (61) | -.132 (61) | -.082 (61) |
| 30 | .166 (63) | -.301 (63) | .248 (63) | -.184 (63) | .221 (63) | .181 (63) | .189 (63) | .227 (63) | .155 (63) | .217 (63) |
| 31 | -.141 (64) | -.166 (64) | -.166 (64) | -.223 (64) | .080 (64) | -.053 (64) | -.187 (64) | -.176 (64) | -.326 (64) | -.244 (64) |
| 32 | -.167 (56) | -.151 (56) | .100 (56) | -.144 (56) | .020 (56) | -.229 (56) | -.100 (56) | -.137 (56) | -.161 (56) | -.160 (56) |
| 33 | -.087 (48) | -.181 (48) | .015 (48) | .005 (48) | .142 (48) | .055 (48) | .085 (48) | .056 (48) | -.143 (48) | -.124 (48) |
| 34 | .071 (53) | -.367 (53) | -.060 (53) | -.085 (53) | .257 (53) | .132 (53) | .097 (53) | .052 (53) | -.087 (53) | -.093 (53) |
| 35 | -.278 (71) | -.078 (71) | .285 (71) | .078 (71) | .052 (71) | .094 (71) | .086 (71) | -.024 (71) | .081 (71) | .037 (71) |
| 36 | .014 (71) | .011 (71) | -.142 (71) | .126 (71) | .140 (71) | .233 (71) | .007 (71) | -.039 (71) | .000 (71) | .006 (71) |
| 37 | -.079 (71) | .009 (71) | .025 (71) | -.003 (71) | -.043 (71) | .050 (71) | .472 (71) | .382 (71) | .462 (71) | .399 (71) |
| 38 | -.030 (71) | .098 (71) | .028 (71) | .013 (71) | -.052 (71) | .117 (71) | .256 (71) | .246 (71) | .389 (71) | .259 (71) |
| 39 | -.160 (71) | .153 (71) | -.063 (71) | .176 (71) | -.289 (71) | -.005 (71) | .223 (71) | .093 (71) | .256 (71) | .118 (71) |
| 40 | -.053 (71) | -.121 (71) | -.053 (71) | .071 (71) | .151 (71) | .000 (71) | .355 (71) | .250 (71) | .143 (71) | .070 (71) |
| 41 | -.024 (71) | -.038 (71) | .074 (71) | .024 (71) | .001 (71) | .024 (71) | .370 (71) | .331 (71) | .369 (71) | .373 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 42 | -.091 (71) | .188 (71) | -.190 (71) | -.087 (71) | -.176 (71) | -.141 (71) | -.199 (71) | -.022 (71) | -.054 (71) | .015 (71) |
| 43 | .043 (71) | -.051 (71) | .138 (71) | -.092 (71) | .124 (71) | .176 (71) | .362 (71) | .618 (71) | .416 (71) | .627 (71) |
| 44 | .005 (71) | .044 (71) | .003 (71) | -.189 (71) | -.037 (71) | .154 (71) | .268 (71) | .427 (71) | .411 (71) | .474 (71) |
| 45 | -.004 (71) | .038 (71) | .125 (71) | -.130 (71) | -.028 (71) | .099 (71) | .203 (71) | .395 (71) | .243 (71) | .417 (71) |
| 46 | .022 (71) | -.095 (71) | .046 (71) | .039 (71) | .221 (71) | .084 (71) | .441 (71) | .455 (71) | .333 (71) | .304 (71) |
| 47 | .063 (71) | -.081 (71) | .168 (71) | -.049 (71) | .145 (71) | .165 (71) | .251 (71) | .544 (71) | .315 (71) | .596 (71) |
| 48 | -.099 (71) | .117 (71) | -.261 (71) | -.155 (71) | -.152 (71) | -.274 (71) | -.311 (71) | -.310 (71) | -.262 (71) | -.287 (71) |
| 49 | -.084 (70) | -.052 (70) | -.091 (70) | -.087 (70) | .218 (70) | .013 (70) | .053 (70) | -.011 (70) | .082 (70) | .015 (70) |
| 50 | -.122 (70) | .005 (70) | -.120 (70) | -.195 (70) | .070 (70) | -.032 (70) | -.049 (70) | -.033 (70) | .027 (70) | -.010 (70) |
| 51 | -.272 (70) | -.030 (70) | -.075 (70) | -.029 (70) | .145 (70) | -.012 (70) | -.043 (70) | -.172 (70) | .002 (70) | -.063 (70) |
| 52 | .185 (70) | -.050 (70) | -.130 (70) | -.144 (70) | .286 (70) | -.037 (70) | -.072 (70) | -.027 (70) | .001 (70) | -.036 (70) |
| 53 | -.013 (70) | -.068 (70) | .032 (70) | .083 (70) | .142 (70) | .086 (70) | .225 (70) | .128 (70) | .145 (70) | .104 (70) |
| 54 | .107 (62) | -.046 (62) | -.139 (62) | .189 (62) | .101 (62) | .007 (62) | -.112 (62) | -.202 (62) | -.081 (62) | -.111 (62) |
| 55 | .054 (62) | -.005 (62) | -.150 (62) | .165 (62) | .176 (62) | .055 (62) | -.255 (62) | -.231 (62) | -.191 (62) | -.137 (62) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 56 | -.181 (62) | -.202 (62) | -.219 (62) | .122 (62) | -.006 (62) | .003 (62) | -.149 (62) | -.286 (62) | -.128 (62) | -.212 (62) |
| 57 | .226 (62) | -.118 (62) | .027 (62) | -.028 (62) | .006 (62) | -.092 (62) | -.066 (62) | -.130 (62) | .010 (62) | -.099 (62) |
| 58 | .162 (62) | .120 (62) | -.007 (62) | .159 (62) | .043 (62) | .014 (62) | .153 (62) | .082 (62) | .097 (62) | .112 (62) |
| 59 | .049 (62) | .154 (62) | .067 (62) | -.163 (62) | -.189 (62) | .061 (62) | .118 (62) | .111 (62) | .149 (62) | .141 (62) |
| 60 | -.002 (62) | -.236 (62) | -.109 (62) | .023 (62) | .063 (62) | .097 (62) | .069 (62) | .066 (62) | -.025 (62) | .020 (62) |
| 61 | -.116 (61) | -.241 (61) | -.122 (61) | -.066 (61) | .000 (61) | -.017 (61) | .042 (61) | -.066 (61) | -.003 (61) | -.075 (61) |
| 62 | -.114 (62) | -.104 (62) | -.057 (62) | -.024 (62) | -.071 (62) | .027 (62) | -.126 (62) | -.115 (62) | -.079 (62) | -.065 (62) |
| 63 | -.109 (62) | -.238 (62) | -.113 (62) | -.086 (62) | -.009 (62) | -.101 (62) | .030 (62) | -.065 (62) | -.005 (62) | -.073 (62) |
| 64 | .220 (54) | -.044 (54) | .482 (54) | -.008 (54) | -.165 (54) | -.113 (54) | .082 (54) | .018 (54) | .183 (54) | .102 (54) |
| 65 | -.078 (55) | -.026 (55) | -.172 (55) | -.044 (55) | .238 (55) | -.147 (55) | -.084 (55) | -.001 (55) | -.020 (55) | -.026 (55) |
| 66 | .269 (56) | -.107 (56) | -.063 (56) | .106 (56) | .154 (56) | .130 (56) | .101 (56) | .134 (56) | .088 (56) | .124 (56) |
| 67 | .069 (60) | .153 (60) | -.119 (60) | .166 (60) | -.030 (60) | -.020 (60) | .352 (60) | .286 (60) | .376 (60) | .330 (60) |
| 68 | .028 (62) | -.012 (62) | .138 (62) | -.221 (62) | -.191 (62) | .102 (62) | .091 (62) | .096 (62) | .068 (62) | .081 (62) |
| 69 | .143 (62) | .179 (62) | .063 (62) | .014 (62) | .139 (62) | .083 (62) | .120 (62) | .178 (62) | .127 (62) | .185 (62) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 1 | 2 | 3 | 4 | 10 | 15 | 21 | 22 | 23 | 24 |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | .222 (62) | .199 (62) | .123 (62) | -.024 (62) | -.002 (62) | .077 (62) | .055 (62) | .077 (62) | .140 (62) | .179 (62) |
| 71 | .072 (62) | -.001 (62) | -.029 (62) | -.031 (62) | .260 (62) | -.018 (62) | .031 (62) | .031 (62) | .079 (62) | .116 (62) |
| 72 | .060 (62) | .108 (62) | -.004 (62) | -.160 (62) | .088 (62) | .013 (62) | -.041 (62) | -.011 (62) | .000 (62) | -.028 (62) |
| 73 | .124 (62) | .168 (62) | .053 (62) | .084 (62) | .069 (62) | .169 (62) | .166 (62) | .194 (62) | .111 (62) | .144 (62) |
| 74 | .018 (62) | .073 (62) | -.050 (62) | -.048 (62) | -.278 (62) | .103 (62) | .162 (62) | -.037 (62) | .109 (62) | -.101 (62) |
| 75 | .113 (71) | .156 (71) | .042 (71) | -.112 (71) | .099 (71) | .005 (71) | .060 (71) | .152 (71) | .222 (71) | .257 (71) |
| 76 | .104 (71) | .218 (71) | .010 (71) | -.165 (71) | .006 (71) | -.094 (71) | .094 (71) | .067 (71) | .243 (71) | .168 (71) |
| 77 | -.060 (71) | .014 (71) | -.083 (71) | -.139 (71) | .081 (71) | -.153 (71) | -.070 (71) | -.027 (71) | .083 (71) | .104 (71) |
| 78 | .054 (71) | .000 (71) | .031 (71) | -.127 (71) | .112 (71) | .042 (71) | .025 (71) | .190 (71) | .173 (71) | .052 (71) |
| 79 | .146 (71) | .159 (71) | .095 (71) | -.043 (71) | .069 (71) | .086 (71) | .085 (71) | .232 (71) | .183 (71) | .309 (71) |
| 80 | -.025 (71) | .000 (71) | -.063 (71) | .091 (71) | -.144 (71) | .161 (71) | .004 (71) | -.061 (71) | -.120 (71) | -.155 (71) |

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .043 (71) | .105 (71) | -.001 (71) | .020 (71) | -.079 (71) | .043 (71) | -.084 (70) | .107 (62) | .143 (62) | .113 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | -.157 (71) | .015 (71) | .029 (71) | .057 (71) | .009 (71) | -.051 (71) | -.052 (70) | -.046 (62) | .179 (62) | .156 (71) |
| 3 | -.052 (71) | -.013 (71) | .081 (71) | .215 (71) | .025 (71) | .138 (71) | -.091 (70) | -.139 (62) | .063 (62) | .042 (71) |
| 4 | .189 (71) | .125 (71) | .023 (71) | -.089 (71) | -.003 (71) | -.092 (71) | -.087 (70) | .189 (62) | .014 (62) | -.112 (71) |
| 5 | -.138 (46) | -.006 (46) | .209 (46) | .453 (46) | .110 (46) | .317 (46) | .209 (46) | .127 (38) | -.127 (38) | .097 (46) |
| 6 | -.273 (43) | -.162 (43) | .097 (43) | .312 (43) | .158 (43) | .262 (43) | .188 (43) | .098 (38) | .138 (38) | .305 (43) |
| 7 | -.271 (43) | -.258 (43) | .006 (43) | .178 (43) | -.137 (43) | .027 (43) | .360 (43) | .278 (38) | -.106 (38) | -.003 (43) |
| 8 | -.042 (43) | .109 (43) | .318 (43) | .496 (43) | .204 (43) | .399 (43) | .369 (43) | -.037 (38) | -.143 (38) | .072 (43) |
| 9 | -.058 (43) | .100 (43) | .208 (43) | .343 (43) | .120 (43) | .383 (43) | .433 (43) | -.020 (38) | -.187 (38) | -.023 (43) |
| 10 | .026 (71) | .109 (71) | .032 (71) | .059 (71) | -.043 (71) | .124 (71) | .218 (70) | .101 (62) | .139 (62) | .099 (71) |
| 11 | -.175 (71) | .073 (71) | -.007 (71) | -.019 (71) | .171 (71) | .144 (71) | .264 (70) | .147 (62) | -.012 (62) | -.045 (71) |
| 12 | -.277 (71) | .031 (71) | -.005 (71) | -.002 (71) | .094 (71) | .149 (71) | .320 (70) | .167 (62) | .008 (62) | .062 (71) |
| 13 | -.046 (71) | .110 (71) | -.008 (71) | -.035 (71) | .234 (71) | .122 (71) | .173 (70) | .109 (62) | -.034 (62) | -.155 (71) |
| 14 | -.091 (70) | -.046 (70) | .031 (70) | .149 (70) | .040 (70) | .216 (70) | .516 (70) | .001 (61) | -.123 (61) | .037 (70) |
| 15 | .264 (71) | .393 (71) | .050 (71) | .139 (71) | .050 (71) | .176 (71) | .013 (70) | .007 (62) | .083 (62) | .005 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | -.172 (66) | .096 (66) | .068 (66) | .208 (66) | .191 (66) | .356 (66) | .338 (65) | .220 (57) | .041 (57) | .147 (66) |
| 17 | -.093 (68) | -.011 (68) | .073 (68) | .203 (68) | .069 (68) | .102 (68) | .198 (67) | -.075 (59) | -.065 (59) | .065 (68) |
| 18 | -.014 (69) | .149 (69) | .122 (69) | .058 (69) | .187 (69) | .116 (69) | .106 (70) | -.048 (60) | -.081 (60) | -.027 (69) |
| 19 | -.093 (48) | -.068 (48) | .206 (48) | .333 (48) | .296 (48) | .337 (48) | .232 (70) | -.280 (48) | -.135 (48) | .047 (48) |
| 20 | .207 (71) | .332 (71) | .053 (71) | .011 (71) | .025 (71) | .090 (71) | -.061 (70) | -.097 (62) | .073 (62) | -.048 (71) |
| 21 | .689 (71) | .515 (71) | .221 (71) | .226 (71) | .472 (71) | .362 (71) | .053 (70) | -.112 (62) | .120 (62) | .060 (71) |
| 22 | .352 (71) | .720 (71) | .294 (71) | .385 (71) | .382 (71) | .618 (71) | -.011 (70) | -.202 (62) | .178 (62) | .152 (71) |
| 23 | .221 (71) | .255 (71) | .304 (71) | .298 (71) | .462 (71) | .416 (71) | .082 (70) | -.081 (62) | .127 (62) | .222 (71) |
| 24 | .062 (71) | .357 (71) | .369 (71) | .415 (71) | .399 (71) | .627 (71) | .015 (70) | -.111 (62) | .185 (62) | .257 (71) |
| 25 | 1.000 (71) | .635 (71) | -.006 (71) | -.002 (71) | .209 (71) | .046 (71) | -.023 (70) | -.138 (62) | .048 (62) | -.186 (71) |
| 26 | .635 (71) | 1.000 (71) | -.012 (71) | .126 (71) | .158 (71) | .312 (71) | -.007 (70) | -.209 (62) | .121 (62) | -.082 (71) |
| 27 | -.006 (71) | -.012 (71) | 1.000 (71) | .666 (71) | .521 (71) | .490 (71) | -.021 (70) | -.164 (62) | .128 (62) | .323 (71) |
| 28 | -.002 (71) | .126 (71) | .666 (71) | 1.000 (71) | .429 (71) | .614 (71) | .006 (70) | -.202 (62) | .175 (62) | .357 (71) |
| 29 | .086 (61) | -.065 (61) | -.007 (61) | .025 (61) | .041 (61) | .167 (61) | .048 (60) | -.065 (52) | -.075 (52) | -.060 (61) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | .111 (63) | .089 (63) | .024 (63) | .235 (63) | .260 (63) | .396 (63) | .092 (62) | -.100 (54) | .183 (54) | .224 (63) |
| 31 | .032 (64) | -.043 (64) | -.141 (64) | .035 (64) | -.011 (64) | .129 (64) | .132 (63) | .181 (57) | .065 (57) | .100 (64) |
| 32 | .020 (56) | -.102 (56) | -.020 (56) | .028 (56) | .036 (56) | .103 (56) | .056 (55) | .068 (50) | .095 (50) | .018 (56) |
| 33 | .340 (48) | .264 (48) | -.041 (48) | -.104 (48) | .085 (48) | .022 (48) | .288 (47) | -.007 (42) | -.160 (42) | -.133 (48) |
| 34 | .276 (53) | .187 (53) | -.121 (53) | .025 (53) | -.041 (53) | .005 (53) | .163 (52) | -.078 (46) | -.276 (46) | -.162 (53) |
| 35 | .047 (71) | -.085 (71) | .231 (71) | .137 (71) | .169 (71) | .134 (71) | .196 (70) | .200 (62) | .103 (62) | .113 (71) |
| 36 | .016 (71) | -.096 (71) | -.031 (71) | -.118 (71) | -.016 (71) | .016 (71) | .147 (70) | .290 (62) | -.166 (62) | -.080 (71) |
| 37 | .209 (71) | .158 (71) | .521 (71) | .429 (71) | 1.000 (71) | .664 (71) | -.016 (70) | -.033 (62) | .241 (62) | .300 (71) |
| 38 | -.085 (71) | -.040 (71) | .424 (71) | .237 (71) | -.135 (71) | .604 (71) | .152 (70) | .195 (62) | .120 (62) | .256 (71) |
| 39 | .053 (71) | .002 (71) | .311 (71) | .250 (71) | .567 (71) | .321 (71) | -.086 (70) | -.038 (62) | .185 (62) | .275 (71) |
| 40 | .480 (71) | .450 (71) | -.052 (71) | -.050 (71) | .320 (71) | .175 (71) | .031 (70) | -.071 (62) | .061 (62) | -.005 (71) |
| 41 | .134 (71) | .065 (71) | .514 (71) | .430 (71) | .846 (71) | .580 (71) | -.077 (70) | -.093 (62) | .222 (62) | .241 (71) |
| 42 | -.269 (71) | -.023 (71) | -.017 (71) | -.109 (71) | -.085 (71) | 0.047 (71) | 0.088 (70) | .103 (62) | .063 (62) | .024 (71) |
| 43 | .046 (71) | .312 (71) | .490 (71) | .614 (71) | .664 (71) | 1.000 (71) | .091 (70) | -.034 (62) | .250 (62) | .323 (71) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 44 | -.093 (71) | .167 (71) | .395 (71) | .502 (71) | .509 (71) | .744 (71) | .187 (70) | -.005 (62) | .171 (62) | .292 (71) |
| 45 | -.018 (71) | .198 (71) | .282 (71) | .453 (71) | .386 (71) | .707 (71) | -.102 (70) | .015 (62) | .289 (62) | .244 (71) |
| 46 | .353 (71) | .490 (71) | .143 (71) | .230 (71) | .376 (71) | .554 (71) | .137 (70) | -.113 (62) | .037 (62) | .058 (71) |
| 47 | -.023 (71) | .187 (71) | .510 (71) | .579 (71) | .626 (71) | .909 (71) | .064 (70) | -.009 (62) | .221 (62) | .318 (71) |
| 48 | -.198 (71) | -.161 (71) | -.059 (71) | -.214 (71) | -.186 (71) | -.267 (71) | -.145 (70) | .263 (62) | -.004 (62) | -.062 (71) |
| 49 | -.023 (70) | -.007 (70) | -.021 (70) | .006 (70) | -.016 (70) | .091 (70) | 1.000 (70) | .434 (61) | .117 (61) | .071 (70) |
| 50 | -.131 (70) | -.024 (70) | -.036 (70) | .026 (70) | -.042 (70) | .089 (70) | .782 (70) | .242 (61) | .009 (61) | .108 (70) |
| 51 | -.092 (70) | -.225 (70) | -.036 (70) | .013 (70) | -.084 (70) | .001 (70) | .733 (70) | .421 (61) | .095 (61) | .051 (70) |
| 52 | -.130 (70) | .009 (70) | .025 (70) | .081 (70) | -.018 (70) | .102 (70) | .566 (70) | .074 (61) | .026 (61) | .112 (70) |
| 53 | .197 (70) | .142 (70) | -.005 (70) | -.062 (70) | .066 (70) | .058 (70) | .657 (70) | .403 (61) | .158 (61) | -.037 (70) |
| 54 | -.138 (62) | -.209 (62) | -.164 (62) | -.202 (62) | -.033 (62) | -.034 (62) | .434 (61) | 1.000 (63) | .207 (63) | .142 (63) |
| 55 | -.244 (62) | -.258 (62) | -.129 (62) | -.167 (62) | -.113 (62) | -.030 (62) | .288 (61) | .881 (63) | .198 (63) | .234 (63) |
| 56 | -.165 (62) | -.257 (62) | -.268 (62) | -.286 (62) | -.058 (62) | -.178 (62) | .222 (61) | .630 (63) | -.036 (63) | -.046 (63) |
| 57 | -.136 (62) | -.110 (62) | -.003 (62) | .039 (62) | .012 (62) | .101 (62) | .138 (61) | .323 (63) | -.039 (63) | .071 (63) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 58 | .142 (62) | .062 (62) | -.020 (62) | -.076 (62) | .073 (62) | .025 (62) | .372 (61) | .637 (63) | .284 (63) | .060 (63) |
| 59 | .035 (62) | .078 (62) | .173 (62) | .155 (62) | .254 (62) | .138 (62) | -.115 (61) | -.096 (63) | .337 (63) | .257 (63) |
| 60 | .128 (62) | .102 (62) | -.145 (62) | .186 (62) | .061 (62) | .073 (62) | -.051 (61) | -.063 (63) | .010 (63) | .028 (63) |
| 61 | .032 (61) | -.045 (61) | -.092 (61) | .195 (61) | .124 (61) | .050 (61) | -.012 (60) | -.075 (62) | -.090 (62) | -.027 (62) |
| 62 | -.206 (62) | -.141 (62) | -.251 (62) | -.014 (62) | -.035 (62) | -.078 (62) | -.177 (61) | -.033 (63) | .027 (63) | .091 (63) |
| 63 | .010 (62) | -.043 (62) | -.098 (62) | .194 (62) | .100 (62) | .045 (62) | -.018 (61) | -.082 (63) | -.092 (63) | -.016 (63) |
| 64 | -.084 (54) | -.149 (54) | -.042 (54) | .071 (54) | -.188 (54) | .015 (54) | .024 (53) | .070 (55) | .178 (55) | .151 (55) |
| 65 | -.133 (55) | .038 (55) | -.011 (55) | .287 (55) | .179 (55) | .179 (55) | .210 (54) | -.025 (55) | .230 (55) | .351 (55) |
| 66 | .046 (56) | .123 (56) | -.095 (56) | .054 (56) | .025 (56) | .042 (56) | .070 (55) | .191 (57) | .157 (57) | .126 (57) |
| 67 | .137 (60) | .060 (60) | .400 (60) | .090 (60) | .257 (60) | .186 (60) | .111 (59) | .122 (61) | .155 (61) | .144 (61) |
| 68 | .066 (62) | .082 (62) | -.006 (62) | -.048 (62) | .023 (62) | 0.044 (62) | 0.127 (61) | .070 (63) | .241 (63) | .023 (63) |
| 69 | .048 (62) | .121 (62) | .128 (62) | .175 (62) | .241 (62) | .250 (62) | .117 (61) | .207 (63) | 1.000 (63) | .793 (63) |
| 70 | -.115 (62) | -.113 (62) | -.052 (62) | -.104 (62) | .169 (62) | .093 (62) | .118 (61) | .283 (63) | .721 (63) | .619 (63) |
| 71 | -.064 (62) | -.054 (62) | .151 (62) | .270 (62) | .200 (62) | .263 (62) | .051 (61) | .222 (63) | .613 (63) | .438 (63) |

Appendix N (Cont.)
Correlation Matrix of the Criterion Variables
and Other Selected Variables with the
Student Teaching Variables

| Var. No. | 25 | 26 | 27 | 28 | 37 | 43 | 49 | 54 | 69 | 75 |
|---|---|---|---|---|---|---|---|---|---|---|
| 72 | -.013 (62) | .012 (62) | .259 (62) | .195 (62) | .146 (62) | .171 (62) | .031 (61) | -.185 (63) | .482 (63) | .447 (63) |
| 73 | .149 (62) | .217 (62) | .081 (62) | .130 (62) | .188 (62) | .175 (62) | .109 (61) | .226 (63) | .911 (63) | .729 (63) |
| 74 | .159 (62) | .058 (62) | .000 (62) | -.101 (62) | -.141 (62) | -.189 (62) | -.154 (61) | -.068 (63) | -.222 (63) | -.347 (63) |
| 75 | -.186 (71) | -.082 (71) | .323 (71) | .357 (71) | .300 (71) | .323 (71) | .071 (70) | .142 (63) | .793 (63) | 1.000 (72) |
| 76 | -.164 (71) | -.114 (71) | .250 (71) | .230 (71) | .317 (71) | .288 (71) | .059 (70) | .133 (63) | .647 (63) | .844 (72) |
| 77 | -.252 (71) | -.173 (71) | .155 (71) | .283 (71) | .091 (71) | .242 (71) | .103 (70) | .249 (63) | .410 (63) | .612 (72) |
| 78 | -.150 (71) | -.054 (71) | .230 (71) | .232 (71) | .146 (71) | .137 (71) | .068 (70) | -.145 (63) | .373 (63) | .568 (72) |
| 79 | -.085 (71) | .000 (71) | .260 (71) | .293 (71) | .278 (71) | .261 (71) | .065 (70) | .126 (63) | .778 (63) | .884 (72) |
| 80 | .165 (71) | .106 (71) | .011 (71) | -.035 (71) | -.165 (71) | -.110 (71) | -.034 (70) | .088 (63) | -.287 (63) | -.393 (72) |

Fold-Out Listing of Student Teacher and Cooperating Teacher Variables Used in Correlational Analyses for the Student Teaching Quarter

1. School classification (suburban, intermediate, urban)

Student Teacher Variables

2. Sex (male, female)
3. Age
4. Senior Project participation (no, yes)
5. ACT composite percentile
6. ACT English percentile
7. ACT mathematics percentile
8. ACT social studies percentile
9. ACT natural science percentile
10. Knowledge of modern mathematics score (Massie's test)
11. CTAT:SP composite score
12. CTAT:SP Teacher-Pupil Relationships subscale
13. CTAT:SP Personal Adjustment subscale
14. CTAT:PP score
15. Commitment to Teaching (less, same, greater)
16. GPA (before entering education)
17. GPA (before entering student teaching)
18. GPA in mathematics (post-calculus courses)
19. GPA in pre-student teaching block
20. Junior Project participation
*21. CAI composite score - pretest
*22. CAI composite score - posttest
*23. CAI attitude subscale - pretest
*24. CAI attitude subscale - posttest
*25. CAI knowledge subscale - pretest
*26. CAI knowledge subscale - posttest
27. TSMI pretest
*28. TSMI posttest
29. Grade level preferences - pretest (elementary, junior high, senior high, college)
30. Grade level preferences - posttest (elementary, junior high, senior high, college)
31. Kind of school preferences - pretest (urban, intermediate, suburban, rural)
32. Kind of school preferences - posttest (urban, intermediate, suburban, rural)
33. Type of student preferences - pretest (special, slow, average, accelerated)
34. Type of student preferences - posttest (special, slow, average, accelerated)
35. Marital status (single, married)
36. Transfer student (no, yes)

MTI:TP - pretest

*37. Composite score
38. Perceptions of Teacher-Pupil Roles subscale
39. Use of Textbook subscale
40. Design and Use of Tests subscale
41. Strategies of Teaching Mathematics subscale
42. Mathematical Orientation subscale

MTI:TP - posttest

*43. Composite score
44. Perceptions of Teacher-Pupil Roles subscale
45. Use of Textbooks subscale
46. Design and Use of Tests subscale
47. Strategies of Teaching Mathematics subscale
48. Mathematical Orientation subscale

MTI:SP

*49. Composite score
50. Perceptions of Teacher-Pupil Roles subscale
51. Use of Textbook subscale
52. Design and Use of Tests subscale
53. Strategies of Teaching Mathematics subscale

Cooperating Teacher Variables

MTI:SP

54. Composite score
55. Perceptions of Teacher-Pupil Roles subscale
56. Use of Textbook subscale
57. Design and Use of Tests subscale
58. Strategies of Teaching Mathematics subscale

59. Sex (male, female)
60. Age
61. Total number of years of teaching experience
62. Number of student teachers
63. Total number of years teaching mathematics
64. Number of undergraduate quarter hours of mathematics
65. Number of graduate quarter hours in education
66. Number of graduate quarter hours in mathematics
67. Year last studied mathematics
68. Number of classes taught

MTI:TP - pretest

69. Composite score
70. Perceptions of Teacher-Pupil Roles subscale
71. Use of Textbook subscale
72. Design and Use of Tests subscale
73. Strategies of Teaching Mathematics subscale
74. Mathematical Orientation subscale

MTI:TP - posttest

75. Composite score
76. Perceptions of Teacher-Pupil Roles subscale
77. Use of Textbook subscale
78. Design and Use of Tests subscale
79. Strategies of Teaching Mathematics subscale
80. Mathematical Orientation subscale

*denotes criterion variable

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